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FINAL REPORT

COMPARISON TEST

OF

THE HEAVY EXPANDED MOBILITY TACTICAL TRUCK

(HEMTT), M978 TANKER

CPT RAYMOND J. LAZZARO

SUPPORT EQUIPMENT DIVISION
CLOSE COMBAT SYSTEMS DIRECTORATE

U.S. ARMY COMBAT SYSTEMS TEST ACTIVITY
ABERDEEN PROVING GROUND, MD 21005-5059

FEBRUARY 1989

Prepared for:
U.S. ARMY TANK-AUTOMOTIVE COMMAND
WARREN, MI 48397-5000

U.S. ARMY TEST AND EVALUATION COMMAND
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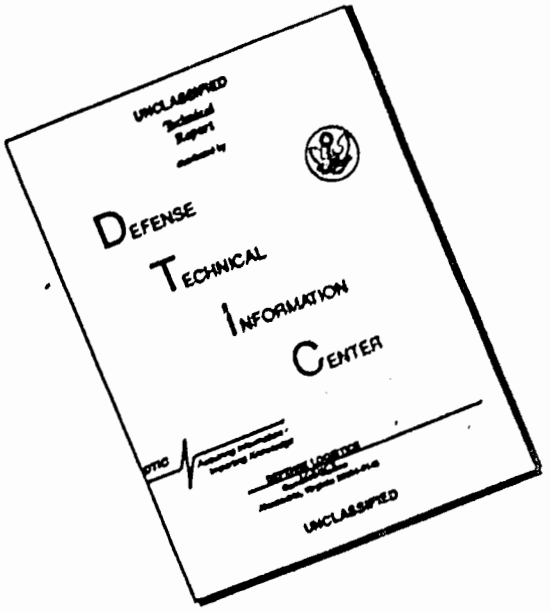

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The Comparison Test (CPT) of the Heavy Expanded Mobility Tactical Truck (HEMTT), M978 Tanker was conducted by the U.S. Army Combat Systems Test Activity, Aberdeen Proving Ground, MD, ~~from 14 April to 28 December 1988~~. The objectives were to assure that vehicles being currently produced meet or exceed the performance of Initial Production Test vehicles; to verify that corrective actions on previous deficiencies and shortcomings have been accomplished and are adequate; and to provide evidence of the contractor's conformance to contractual requirements. This report covers the results of the following subtests: Initial/Final Inspection and Servicing, Stowage, Physical Characteristics, Gradeability and Side Slope Performance, Steering and Turning, Tie-down and Sling Provisions, Weight Distribution, Braking, Acceleration, Self-recovery Winch Capability, Toxic Fumes, Fording, Environmental Operations, Electromagnetic Interference, Human Factors Engineering, Safety, Logistic Supportibility, and Endurance and Reliability. The M978 tanker accumulated 8,048 km (5,001 mi) of operation and 50.8 power takeoff (PTO) hours of pumping operations. (SDW)

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Warren, Mi 48397-5000

DEPARTMENT OF THE ARMY
U.S. ARMY COMBAT SYSTEMS TEST ACTIVITY
ABERDEEN PROVING GROUND, MARYLAND 21005-5059

REPLY TO
ATTENTION OF

STECS-CC-SW (70-10r)

8 FEB 1999

MEMORANDUM FOR: Commander, U.S. Army Tank-Automotive Command, ATTN: AMSTA-QWH, Warren, MI 48397-5000

SUBJECT: Final Report for Comparison Test of the Heavy Expanded Mobility Tactical Truck (HEMTT), M978 Tanker, TECOM Project No. 1-VG-120-HMT-028, Report No. USACSTA-6800

1. REFERENCES

a. Letter, TECOM, AMSTE-TE-R, 19 October 1987, subject: Test Execution Directive for Comparison Test, Heavy Expanded Mobility Tactical Truck (HEMTT) M978 Tanker, TECOM Project No. 1-VG-120-HMT-028.

b. Letter, TACOM, AMSTA-QAM, 5 October 1987, subject: CPT of HEMTT, M978 Tanker, DAAE07-87-C-J977, TECOM Project No. 1-VG-120-HMT-BAH.

The remaining references are listed in Enclosure 2.

2. BACKGROUND

Authority to conduct this test is given in Reference 1a.

The U.S. Army has purchased a family of Heavy Expanded Mobility Tactical Trucks (HEMTTs) for use in support of the Army's ammunition resupply, refueling, recovery/evacuation, general cargo handling, and missile transport requirements. The family of vehicles consists of on- and off-road capabilities through a diesel engine driven, double tandem, all-wheel drive power train with an automatic transmission. The HEMTT family consists of two chassis; the Type I, which covers the M977, M978, M984E1, and M985 models, and the Type II, which covers the M983 model. The five models are: two cargo trucks (M977 and M985) with different capacity rear mounted material handling cranes, a 2500-gallon fuel tanker (M978), a tractor for missile transport (M983), and a wrecker (M984E1).

An Initial Production Evaluation/First Article Test (IPE/FAT) of the HEMTT family was conducted from July 1982 through March 1985. The testing was accomplished in three phases due to various incidents that occurred during testing. The M978 HEMTT tanker was subjected to testing during Phases I and II with significant problems noted during each of these phases. The ancillary pump station piping was reconfigured and hard-lift points were added to the front and rear of the vehicle. Due to manufacturer performing engineering changes the M978 was not retested during Phase III.

Comparison testing was first conducted on the M978 tanker from May 1985 to January 1987.

3. TEST OBJECTIVES

The objectives were:

a. To assure vehicles being produced under contract DAAE07-87-C-J977 meet or exceed the performance of vehicles tested during initial production testing (IPT) for contract DAAE07-81-C-5760.

b. To provide evidence of the contractor's conformance to contractual requirements and of the adequacy of the quality assurance procedures.

c. To verify that corrective actions on deficiencies and/or shortcomings have been accomplished and are adequate.

d. To demonstrate that the contractor is continuing to incorporate changes for improvement into vehicles now being produced.

4. SCOPE

The comparison test of the M978 tanker consisted of 8,048 km (5,001 mi) of endurance operation over a variety of test courses and 50.8 hours of ancillary operation (pumping). In addition, the M978 underwent the following performance tests: Initial/Final Inspection and Servicing, Stowage, Physical Characteristics, Gradeability and Side Slope Performance, Steering and Turning, Tie-down and Sling Provisions, Weight Distribution and Ground Pressure, Braking, Acceleration, Self-recovery Winch Capability, Toxic Fumes, Fording, Environmental Operation, Electromagnetic Interference (EMI), and Human Factors Engineering. Data relative to safety and logistic supportability were collected throughout the test.

The environmental impact of the test was considered and determined not to be significant. A record of environmental consideration was submitted.

Criteria for the CPT were derived from the performance specification for the M977 series vehicle (encl 2, ref 5), and as deemed necessary by the test agency.

Acknowledgement is given to Mr. John Schenk for his efforts as the maintenance evaluator, Mr. Don Mann for his efforts as the data coordinator, and Ms. Gerrie Smith for her efforts as the data processor.

5. SUMMARY OF RESULTS

This report covers the comparison production testing of the HEMTT M978 tanker by the U.S. Army Combat Systems Test Activity (USACSTA), Aberdeen Proving Ground, MD. The test was conducted from 14 April to 28 December 1988. Details of the test are included as Enclosure 1. A list showing compliance to the performance specification is included as Enclosure 3. Deficiencies, shortcomings, and suggested improvements are included as Enclosure 4. Performance test data are included as Enclosure 5 and logistic data as Enclosure 6.

5 (Cont'd)

The following is a synopsis of the test results:

a. Initial/Final Inspection and Service (encl 1, para 2). The vehicle was given limited visual and functional inspections. Only minor adjustments were necessary during the initial inspection. Testing revealed the fluid passage bolt on the tow pintle was not properly machined; the V5 butterfly valve was not properly adjusted; and the bulk tank fuel level sensor was not properly calibrated (shortcoming, quality defects).

b. Stowage (para 3). All BII were inventoried and mounted on the vehicle. No interference was noted. The inventory revealed that the intervehicular (slave) cable was not shipped (shortcoming).

c. Physical Characteristics (para 4). The M978 exceeded the maximum overall width requirement of 243.8 cm (96 in.) by 13.5 cm (5.3 in.) (shortcoming). The angle of approach was 41° versus a requirement of not less than 43° (shortcoming). All other physical dimension requirements were met. The maximum flow rate attained during the bulk unload operation using a power take-off (PTO) driven pump and filtered fuel was 969 L/min (256 gpm) versus a requirement of 1135 L/min (300 gpm) (shortcoming). Automotive fuel servicing was satisfactory through both hose reels. The bulk tank fuel level sensor was noted to be out of calibration. With the tank full, the sensor read anywhere from one-half to three-quarters full (shortcoming).

d. Gradeability and Side Slope Performance (para 5). The vehicle was able to ascend and descend, both in the forward and reverse directions, longitudinal grades up to and including 60%. Service brake holding ability was satisfactory on the 60% grade with the vehicle loaded to its gross vehicle weight (GVW) and pointed both up- and downhill. Parking brake holding ability was satisfactory on grades up to and including 40% in both the forward and reverse directions. The loaded M978 satisfactorily negotiated the 20 and 30% side slopes; engine operation, restart, and steering performance were also satisfactory. On longitudinal grades steeper than 15%, fuel leaked from the overpressure relief valve into the area of the engine compartment (Class IIC safety hazard, deficiency).

e. Steering and Turning (para 6). The left and right minimum turning diameters were 29.1 meters (95.4 ft) and 28.1 meters (92.2 ft), respectively versus a requirement of not more than (30.4 m) 100 feet.

f. Tie-down and Sling Provisions (para 7). The tie-down and lift provisions of the M978 met the requirements of MIL-T-PD-977, and MIL-STD-209G with respect to withstanding the forces applied without deformation or damage. The towing pintle was not able to accept grease due to improper machining of the fluid passage bolt (quality defect, shortcoming).

g. Weight Distribution and Ground Pressure (para 8). Weight distribution for transport on the C130 and C141 was obtainable without disassembly.

5 (Cont'd)

h. Braking (para 9). The service and parking brake characteristics of the M978 were satisfactory. The physical characteristics of the service brake system complied with the requirements of MIL-T-PD-977. Average stopping distance from 32.7 km/hr (20.3 mph) was 9.7 meters (31.8 ft). Average stopping distance from 64.1 km/hr (39.8 mph) was 36.3 meters (119.0 ft).

i. Acceleration: Maximum and Minimum Speeds (para 10). Minimum and maximum speeds were measured to be 2.8 km/hr (1.7 mph) and 100.0 km/hr (62.1 mph), respectively. Acceleration to 80 km/hr (50 mph) took 43.2 seconds.

j. Self-recovery Winch Capability (para 11). Two successive front pulls were accomplished at 90% maximum rated load. At the end of the second pull, the hydraulic reservoir temperature was 93 °C (200 °F). Line speed varied between 7.9 and 8.1 m/sec (26.1 and 26.5 ft/min) versus a requirement of at least 15 ft/min. Total cable length was 61.1 meters (200.5 ft) versus a requirement of at least 60.9 meters (200 ft). Usable cable length was 55.1 meters (180.7 ft).

k. Toxic Fumes (para 12). Concentrations of CO, NO_2, and SO_2 were monitored at the driver's and passenger's seats during moving trials and at the pumping station as well as the driver's and passenger's seats during stationary trials. Under all operating conditions, concentrations of these compounds were at an acceptable level and met OSHA requirements.

l. Fording (para 13). The M978 was driven into the Munson area fording basin at a depth of 121.9 cm (48 in.), idled for 2 minutes, shut down for 2 minutes, then restarted and idled for 1 minute. Engine, hydraulic system, and power-train lubricants were not contaminated as a result of the exercise. Water leaked into the cab around both the left and right door seals with no drainage provisions (shortcoming).

m. Environmental Operations (para 14). Engine starting ability, personnel heater, and windshield defroster tests were successfully conducted at -32 °C (-25 °F). However, the hand actuated valve control air hose ruptured which rendered the pumping system inoperative. Additionally, the D1 nozzle could not be installed without first warming it up, and the V5 air actuated butterfly valve would not open. It was discovered that the disk in the V5 valve was not adjusted over the center of the valve seat (shortcoming). At low temperatures, the rubber valve seat hardened, thus preventing the disk from rotating over the crown of the valve seat. The disk was then adjusted to the center of the seat and operations were continued at -46 °C (-50 °F). At this temperature, the following discrepancies were noted: the bulk delivery hoses were so stiff they could not be bent for installation (deficiency); after opening, the V5 valve would not close (information); the rubber boot on the ether start switch was too stiff to activate (shortcoming); the front main engine seal developed a leak serious enough to terminate testing. Failure of the ancillary fuel dispensing system to operate at low temperatures was classified as a deficiency.

5 (Cont'd)

n. Electromagnetic Interference (para 15). The radiated emissions test (UM03 of MIL-STD-461B) was conducted with specific emphasis over the frequency range of 30.0 to 75.95 MHz. Radiated emissions from the low-air warning buzzer and horn did not meet the allowable limits of subtest UM03 (shortcoming). All other subsystems were adequate with respect to radiated emission suppression.

o. Human Factors Engineering (para 16). The steady-state interior noise limit of 85 dB(A) was exceeded at the driver's and passenger's positions at a speed of 88 km/hr (55 mph) with the windows closed and the fan off (shortcoming). Noise levels 25 meters away from the M978 during pumping operations never exceeded 85 dB(A). This met the requirement. Both the permanent and moveable ladders lacked nonskid surfaces (Class IIIC safety hazard, shortcoming). Sharp edges existed on the top of the moveable ladder (Class IIIC safety hazard, shortcoming). Adequate handholds were not provided for climbing the ladder at the rear of the vehicle to access the top fueling port (Class IIIC safety hazard, shortcoming). The travel restraints for the moveable ladder were difficult to use (Class IVA safety hazard, shortcoming).

p. Safety Test (para 17). Fuel leaking from the overpressure relief valve was classified as a safety related deficiency. Further discussion of this item can be found in paragraph 5d. The following shortcomings were also assessed: lack of an electrical master switch (Class IIIC safety hazard); lack of a shroud to completely encircle the fan blades (Class IID safety hazard); limited access to the battery box (Class IIIC safety hazard). Four additional shortcomings were assessed and are discussed in paragraph 5o.

q. Logistic Supportability (para 18). The maintenance ratio (MR) that resulted from testing of the vehicle chassis was 0.046 versus a requirement of not more than 0.23. Average vehicle speed (based on 5,001 miles and 200 operating hours) was 40 km/hr (25 mph). The MR that resulted from testing of the vehicle ancillary system was 0.187 versus a requirement of not more than 0.09 (shortcoming). The primary factor causing this high MR was the pump failures. Repair parts were authorized at the appropriate maintenance levels, consistent with the Repair Parts Special Tools List and skills required to install and align the parts. Even though some discrepancies exist, the technical manuals have progressed to the point that they can be used to adequately maintain and operate the system. There were three areas in which the design of the M978 was prejudicial to ease of maintenance (shortcoming). The front and rear lug nuts are not interchangeable; design of the propeller shafts exposes the needle bearings to dirt during removal; the engine oil and hydraulic filters are not easily accessible.

r. Endurance and Reliability (para 19). The M978 completed 8,048 km (5,001 mi) of endurance and 50.8 PTO hours of operation. The mean miles between system and mission failure (MMBSF) (MMBMF) were 1,667 miles and 2,500 miles, respectively. The chassis reliability requirements were met; however, since the CPT consisted of only 5,000 miles of endurance testing, it can be said with only 64% confidence that the vehicle will achieve the required 1,500 miles between

mission failures. Mean time between failure (MTBF) for the ancillary fuel dispensing system was 12.7 hours versus a requirement of not less than 75 hours (deficiency). Since the CPT consisted of only 50.8 hours of pumping operation, it can be said with only 37% confidence that the ancillary pump will achieve the required 75 hours between failures.

6. CONCLUSIONS

a. The M978 tanker met all of the requirements of the Performance Specification MIL-T-PD-977, except in the following areas:

(1) All BII were not provided with the vehicle.

(2) All of the required fuel dispensing flow rates were not attained.

(3) The overall width exceeded the maximum allowable width and the angle of approach was less than the minimum allowable angle.

(4) Fuel leaked from the overpressure relief valve on longitudinal grades steeper than 15%.

(5) Fuel dispensing operations were not possible at low temperatures.

(6) The bulk tank fuel level sensor was inaccurate.

(7) Radiated emissions from the low-air warning buzzer and horn failed to meet the allowable limits of subtest UM03 over the frequency range of 30.0 to 75.95 MHz.

(8) Steady-state interior levels exceeded the limits of 85 dB(A).

(9) Four shortcomings were assessed against the design of the vehicle with regards to Human Factors Engineering.

(10) The MR for the ancillary system was excessive.

(11) Design of the lug nuts and propeller shafts, and accessibility of the engine oil and hydraulic filters were prejudicial to ease of maintenance.

(12) The MTBF criterion for the ancillary system was not met.

(13) Workmanship was marginal as evidenced by the improper machining of the tow pintle fluid passage bolt; improper adjustment of the V5 butterfly valve; and improper calibration of the bulk tank fuel level sensor.

(14) Lack of an electrical master switch, lack of a shroud to completely encircle the fan blades, and limited access to the batteries are prejudicial to providing work environments which foster effective procedures, work patterns, and safety.

(15) One safety deficiency and seven safety shortcomings were assessed.

b. Corrective action of many of the previously reported shortcomings and deficiencies has not been accomplished, particularly in the area of low temperature testing.

7. RECOMMENDATIONS

It is recommended that the faults delineated in this report be corrected and changes be made in component design and production quality control procedures.

8. Point of contact for this action is CPT Raymond J. Lazzaro, STECS-CC-SW, AV 298-5151/5152.

FOR THE COMMANDER:

JEROLD L. NOOK
Director, Close Combat Systems
Directorate

7 Encls
1. Details of Test
2. References
3. Test Criteria
4. Deficiencies, Shortcomings, and Suggested Improvements
5. Performance Test Data
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DETAILS OF TEST

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1. INTRODUCTION

U.S. Army Combat Systems Test Activity (USACSTA), Aberdeen Proving Ground, MD, was responsible for planning, conducting, and reporting on the Comparison Test of the HEMTT M978 tanker.

Diesel fuel, referee grade, MIL-F-46162B, was used for all test operations except the low temperature environmental chamber tests during which diesel fuel, arctic, VV-F-800A, was used.

All instrumentation used during the testing was calibrated to standards traceable to the National Bureau of Standards.

The U.S. Army Test and Evaluation Command (TECOM) Test Operation Procedures (TOPs) applicable to the various subtests were used as guides in conducting the tests.

Test Incident Reports (TIRs) were furnished on all problems, failures, or significant observations, and performance test results noted throughout the testing.

Photographic coverage was made of major incidents and selected test operations.

Overall test control was the responsibility of the test director from USACSTA. Data collectors from USACSTA collected all operational and maintenance data required by the HEMTT Detailed Test Plan (encl 2, ref 1) using the Automated Data Collection System (ADACS). These data were used for the overall technical assessment of the vehicle and are presented in this final report.

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2. INITIAL/FINAL INSPECTION AND SERVICING

2.1 Objectives

The objectives were:

a. To ensure that the test item was in good and safe condition, and to correct any defects or shipping damage before testing.

b. To ensure that the test item was built in accordance with the requirements of the performance specification.

c. To check fuel and lubricant requirements, accessibility of lubrication fittings, and accessibility of drain plugs.

2.2 Criteria

a. Painting. The exterior and interior of all vehicle types shall be finished or painted to provide a low reflectance surface. The vehicle, body(s), and components shall be cleaned, treated, and painted as follows (MIL-T-PD-977, para 3.1.1.1a):

(1) Clean per applicable method of TT-C-490.

(2) Treat per Type I or III of TT-C-490.

(3) Prime with lead and chromate-free epoxy primer, subject to approval of paint sample by Fort Belvoir, and placing of paint on Qualified Products List.

(4) The topcoat paint shall be a polyurethane type conforming to MIL-C-46168(B)(ME). The final paint color shall be forest green applied in two coats at least 2 mils thick (total) without sags, runs, or thin areas.

Nonferrous surfaces.

(1) Clean and treat aluminum per MIL-C-5541 or anodize per MIL-A-8625. Treat cadmium and zinc per Type III of TT-C-490.

(2) Prime with lead and chromate-free epoxy primer, subject to approval of paint sample by Fort Belvoir, and placing of paint on Qualified Products List.

(3) The topcoat paint shall be a polyurethane type conforming to MIL-C-46168(B)(ME). The final paint color shall be forest green applied in two coats at least 2 mils thick (total) without sags, runs, or thin areas.

Note: Underlined portions were not addressed.

2.2 (Cont'd)

Contact areas of ferrous sheet metal .125 inch thickness and under, which cannot be primed after welding or are not zinc clad steel (see 3.1.1.2), shall be primed as follows before welding:

(1) Clean per TT-C-490.

(2) Prime each contact surface per MIL-P- 46105.

All hardware not normally painted shall be treated to provide limited reflectivity.

b. Markings. Vehicle exterior marking shall be placed and sized in accordance with MIL-STD-462 except "U.S. Army" in 3" high letters shall be used where the 5-pointed star is specified. The registration numbers on both sides and rear of the vehicle and "U.S. Army" on the vehicle front and rear are required on all vehicles. The M978 shall also have on each side and rear of the vehicle (MIL-T-PD-977, para 3.1.1.1b):

(1) "FLAMMABLE" in 6" block letters.

(2) "NO SMOKING WITHIN 50 FEET" in 3" block letters.

All the markings shall be a lusterless black conforming to MIL-E-52798 or MIL-E-52929.

c. Instruction, caution, identification, operating, and data plates. Instruction, caution, identification, operating, and data plates shall be provided and installed in accordance with the manufacturer's normal commercial practice per MIL-STD-1223. Military model number, nomenclature, national stock number (NSN), contract number, date of manufacture, manufacturer's serial number and US Army Registration number shall be embedded or embossed on an additional metal identification plate and installed in the vehicle in a readily visible location. The chassis shall be equipped with instructions, plates, or diagrams, including warnings and cautions describing any special or important procedures to be followed in assembling, operating, or servicing the chassis (MIL-T-PD-977, para 3.1.1.1c).

d. Vehicle class sign kit. A vehicle weight classification sign kit as described in MIL-S-40626 shall be installed at the front of each vehicle in a location behind the bumper that does not interfere with other vehicle functions (MIL-T-PD-977, para 3.1.1.1d).

e. Exterior model name plates and exterior trim. Exterior model name plates and ornamental trim may be eliminated, providing no holes are left (MIL-T-PD-977, para 3.1.1.1e).

Note: Underlined portions were not addressed.

2.2 (Cont'd)

f. Engine. The engine furnished shall be of the compression ignition type, either 2 stroke cycle or four stroke cycle, either liquid cooled or air cooled and not less than six cylinders. Generally the engine must fall into the category of a heavy duty truck engine. The engine must be a commercially proven item and conform to Federal (U.S.) emission standards. The net engine horsepower figures used in performance prediction calculations shall be determined in accordance with SAE J816. The selected engine must pass the 400 hour NATO test which includes running on high sulfur fuel (1+/- .05%). The net effect of the preceding criteria is to maximize fuel economy and minimize the size of the induction system, exhaust system and cooling system. The brake specific fuel consumption of the engine with standard fuel in an emission certified configuration shall not exceed (1) .370 lb/HP Hr when operated at 100 percent load at maximum torque speed and (2) .380 lb/HP Hr when operated at 100 percent load from maximum torque speed to maximum power speed (MIL-T-PD-977, para 3.4.1).

g. Heavy duty cooling system, liquid cooled. A heavy duty cooling system shall be furnished. The cooling system shall maintain the top tank coolant at a temperature recommended by the engine manufacturer but not more than 220 degrees F when operated under the conditions outlined herein in all speed ranges. The radiator pressure cap shall be integrated with the engine manufacturer's overall coolant system recommendation for best commercial practice. The cooling system shall pass the engine manufacturer's cooling test in the installed configuration in ambient air temperature of 120 degrees F. If the radiator cooling system is used to cool the retarder and/or transmission systems, the cooling system shall be capable of adequately cooling these components in addition to the engine as described above at the load/throttle requiring greatest heat rejection. It shall have thermostatic controls for controlling the flow of engine coolant through the radiator. The cooling system shall be adequate to cool all the previously specified components while the truck operates at a .6 tractive effort to actual weight ratio of the M985 in 120 °F ambient air at Wide Open Throttle (WOT). All coolant hoses shall be equal to or better than required by MIL-H-62217 & Federal Spec ZZ-H-428, secured with stainless steel worm gear type hose clamps in accordance with SAE J536, Type F, style 4 (MIL-T-PD-977, para 3.4.1.1).

h. Cooling system and indicators, liquid cooled. The coolant system shall include a de-aeration or equivalent system of sufficient capacity to handle the coolant draw down as required by the engine manufacturer or a coolant recovery reservoir of not less than 5% of the total coolant system capacity. A high coolant temperature warning light or buzzer shall be provided in addition to a temperature gage. The reservoir shall be located in a position readily accessible for inspection and service (MIL-T-PD-977, para 3.4.1.1.2).

i. Governor. Engine governor shall be furnished sealed to provide indication of tampering and limit set to engine manufacturer's maximum recommended operating speed. Governor control linkage (foot throttle) shall be adjustable to permit variable adjustment of engine rpm. The accelerator control system shall conform to FMVSS 124 (MIL-T-PD-977, para 3.4.1.4).

Note: Underlined portions were not addressed.

2.2 (Cont'd)

j. Starting and lighting system. A 24 volt lighting and a 24 volt starting system with an alternator type charging system shall be furnished. The alternator shall provide sufficient amperage (when operating at engine idle speed) to operate all electrical components of the tractor and semitrailer. System will incorporate reverse polarity protection and means to prevent starter engagement with engine running. The vehicles will have slave start capability from other military or similar type vehicles. Intervehicle slaving connections will be accomplished through Cable & Plug Assembly, Intervehicle Power Cable No. 11682336-1 with Power Cable Connector Assembly No. 11682338 and Vehicle Receptacle Assembly No. 11682345 and Installation Drawing No. 11674728. The vehicle shall also be able to slave start MIL-STD-633 generator sets, particularly the MEP104A, see paragraphs 3.4.13.1.11, and 3.5.5.14 (MIL-T-PD-977, para 3.4.2.1).

k. Lighting. All vehicle lights, reflectors, and wiring shall be specified herein and in accordance with MIL-STD-1179. Lights and reflectors shall not be mounted on vehicle bumpers (FMVSS 108 headlight height does not apply). Rear lighting shall be mounted in a protective location to preclude damage when interfacing with other vehicles or ancillary equipment. Polycarbonate lense shall be provided in all lights except sealed beam headlights and service lights. Light control switches must be of a design which permits extinguishing the marker lights on the truck and trailer (when equipped to tow trailers) separate from the service lights per FMVSS 108. All vehicles shall be equipped with a blackout and marker lighting system. In the event there is a conflict between MIL-STD-1179 and DOT requirements, MIL-STD-1179 will take precedence. The M978 tanker body shall have an enclosed weatherproof exterior system (clearance and marker lights). Front turn signals shall be provided that are visible from the side of the vehicle (MIL-T-PD-977, para 3.4.2.2).

l. Batteries. A minimum of four 12 volt storage batteries shall be furnished per MIL-B-11188. The battery mounting and enclosure shall provide space for either low maintenance or standard military batteries with protection from the environment and contaminants in accordance with MS35000. The cold cranking amperage at 0 degrees F shall be in accordance with RCCC-RP No. 109 (MIL-T-PD-977, para 3.4.2.4).

m. Diagnostic Connector Assembly (DCA). The vehicle will incorporate an easily accessible DCA for Simplified Test Equipment/Internal Combustion Engine (STE/ICE) per MIL-T-62314 appendix B. The Diagnostic Connector TARADCOM DRWG 12258941 on the vehicle will interface with the STE/ICE Test Equipment (MIL-T-PD-977, para 3.4.2.7).

Note: Underlined portions were not addressed.

2.2 (Cont'd)

n. Fuel tanks. All vehicle types shall be equipped with corrosion resistant fuel tank(s) adequate to provide a minimum 300 mile operating range based on the rated GCW traveling over a mix of terrains as specified in Table II. When more than one tank is furnished means shall be provided to assure equalized fuel level an draw in both tanks. A manual shutoff valve shall be furnished if two tanks are utilized. Fuel tank(s) will be provided with minimum 3 inch diameter safety type tank filler cap or caps, which can be grasped and removed/installed with arctic mittens. Filler caps shall be located to preclude mud build up and captive chained to filler neck. Removable strainers are required. A sealed filler cap & vent is required for fording requirements. Fuel tank capacity shall be 150 gal plus suitable air space (MIL-T-PD-977, para 3.4.3.1).

o. Transmission. The transmission shall be an automatic as defined in SAE J645 with not less than four (4) forward and 1 reverse gear ranges and must have a gear range capable of meeting the performance specification as stated herein. Manually operated gear reduction devices integral to or separate from the automatic transmission may be utilized to achieve the overall gear reduction required for operation under adverse conditions and to meet cooling requirements, as specified in paragraph 3.4.1.1. The main transmission shall include the following (MIL-T-PD-977, para 3.4.5.1):

(1) A downshift inhibitor system that prevents driver shift control action from overspeeding or damaging the engine, transmission, or drive train components.

(2) A readily accessible transmission oil filter, (if recommended), and heat exchange, if required, for the intended truck application.

(3) A neutral start switch.

(4) A gated type driver control with detent and identification of all shift levers and patterns. The PTO shall have a positive neutral to prevent accidental engagement.

(5) Gear selector shall be illuminated to provide visibility of ranges under all conditions.

(6) A neutral interlock switch shall be provided on all crane-equipped vehicles and on the M978 to prevent actuation of the engine throttle at the crane or tanker control station(s) unless the transmission is in neutral and the hydraulic pump PTO is engaged.

p. Torque Transfer and Control System. The torque transfer system shall have the capability of providing drive to all axles to meet the required vehicle performance and be appropriately rated for torque and power. The system shall have a pressure lubrication system to guard against seizure in case of spinout. The system shall have the provision to provide lockup capability of all inter-axle differentials. If a two-speed drive system is utilized, either

Note: Underlined portion was not addressed.

2.2 (Cont'd)
accomplished within this system or by other drive line components to meet the described vehicle performance needs, the inter-axles lockup shall be driver controlled and operable in either high or low range. The drive system shall permit 8x8 drive in either high or low transfer gear range. The 8x8 drive shall be automatically engaged when the transfer is shifted into low range. A warning light shall be located on the cab dash panel to alert the driver when he is in 8x8 lockup mode (MIL-T-PD-977, para 3.4.5.2).

q. Retarder. A power train retarding device with modulated driver control shall be provided which shall provide, when with other commercially accepted methods of braking augmentation, at least 300 retarding horsepower to the overall vehicle retarding requirement at an engine speed acceptable to the engine manufacturers. In addition, if the retarder has interface with the engine, it shall be approved by the engine manufacturer and shall not by its operation cause an exhaust back-pressure which exceeds the engine manufacturer's allowable limit. Retarder will be variable self-cancelling (including accelerator treadle) type operated by a foot pedal to be operated by the driver. Optionally a self-cancelling (spring loaded) foot control will be acceptable if provided with a yellow warning light which goes on when the retarder is engaged (MIL-T-PD-977, para 3.4.5.3).

r. Power takeoff openings. Heavy Duty Power Takeoff (PTO) capability will be provided on each Type I thru Type V chassis vehicle. The PTO openings will be utilized for the purpose of driving chassis mounted truck hydraulic and mechanical equipment. On the M983 tractor one of the PTO locations must be of sufficient capacity to deliver a minimum of 100 hp (150 desirable) while the vehicle is in motion. The PTO will be suitable for power assisted semitrailer axles which would be driven hydraulically from this PTO per SAE J705 (MIL-T-PD-977, para 3.4.5.4).

s. Traction Control. An accepted off-highway commercial traction control device shall be required in at least two axles of the vehicle without compromise to vehicle steering. The traction control shall insure that power is transmitted to the wheel having traction when the opposite wheel loses traction and may be of an automatic type. If a full locking or controllable biasing traction control device is utilized, it shall feature a manual engagement control and further feature automatic disengagement to preclude axle damage or unsafe vehicle condition in the event excessive vehicle speeds are attained. The device or method shall not degrade axle durability for the life of the vehicle, and if provided by other than the axle manufacturer, shall be certified for rating and application by both axle and device manufacturers (MIL-T-PD-977, para 3.4.7.3).

Note: Underlined portion was not addressed.

2.2 (Cont'd)

t. Tires and tubes. Vehicles shall be equipped with (eight + one spare) nine radial ply tires capable of supporting the vehicle at the rated GVWR. Aggressive tread pattern, compatible with highway operation (ride and wear requirements), is required to meet off-road mobility requirements. Valve caps shall be provided. Tubes are not required unless specifically recommended by the tire manufacturer and all tires must be equipped with adequate valve extensions and be so mounted as to permit checking tire pressure and inflation using only on vehicle equipment (see paragraphs 3.4.13.1.4 and 3.4.13.1.5) (MIL-T-PD-977, para 3.4.8.1).

u. Spare tire and wheel assembly. Spare wheel and tire assembly shall be provided for each vehicle and shall be capable of being installed on either front or rear axles. A spare tire carrier shall be furnished and mounted for each type vehicle in readily accessible location and shall be mounted in such a fashion that the tire can be removed and replaced by a crew of two. Vehicles will be supplied with a davit to facilitate spare tire handling (MIL-T-PD-977, para 3.4.8.2).

v. The manufacturer shall furnish a commercially heavy duty, modified commercial cab, or special designed cab with rear windows to provide the following characteristics. A hard top cab is preferred (MIL-T-PD-977, para 3.4.10).

w. Two (2) person (minimum capacity) (MIL-T-PD-977, para 3.4.10.1).

x. Air transportable as part of the vehicle without preparation (preferred) on C130 aircraft. All equipment removed for air transportation must be self storing on the vehicle and not interfere with other loads or normal actions required for movement in and around the transport aircraft (MIL-T-PD-977, para 3.4.10.2).

y. Upholstered, individually adjustable driver's seat and passenger seat(s). Seats shall be of the suspension type, adjustable fore and aft and to the occupant's height. <u>The range of adjustments shall be sufficient to accommodate the full percentile range of military drivers</u> (MIL-T-PD-977, para 3.4.10.3).

z. Seat belts, anchors and retractors. <u>FMVSS 208, 209 and 210 compliance</u> (MIL-T-PD-977, para 3.4.10.5).

aa. Interior lighting (MIL-T-PD-977, para 3.4.10.6).

bb. Vehicle cab interior. The vehicle cab interior and upholstery color shall be black, dark green or dark brown. All vehicles produced shall have the same interior color(s). All surfaces, fittings, etc., shall have a low reflectance finish. The cab undercarriage shall be insulated to reduce engine noise and heat. Sunvisors for both driver and passenger shall be provided (MIL-T-PD-977, para 3.4.10.7).

Note: Underlined portions were not addressed.

2.2 (Cont'd)

cc. Steering. An integral power steering gear shall be furnished. A mechanical connection between steering wheel and front axle steering mechanism must be in effect under all conditions such that if there is a power steering failure the vehicle can be manually steered and brought to a safe stop. Power steering must have 25 micron (or less) filter for this system (MIL-T-PD-977, para 3.4.11).

dd. Windshield wipers and washers. Vehicle shall be equipped with dual multi-speed windshield wipers and windshield washers. Windshield wipers and washers shall be operated by air (preferred). Washer reservoir with water and appropriate additives for the climatic conditions encountered shall be furnished. Windshield wipers and washers shall conform to FMVSS 104 (MIL-T-PD-977, para 3.4.12).

ee. Accessories and equipment. Chassis equipment shall be complete with all accessories furnished as standard commercial equipment by the manufacturer. The following minimum equipment shall be furnished (MIL-T-PD-977, para 3.4.16):

(1) Locking steering column will be required. The mechanism shall be retained in the locked position by a common padlock.

(2) Voltmeter.

(3) Fuel gage.

(4) Engine oil pressure gage with warning device.

(5) Engine coolant temperature gage with warning device. (Liquid cooled engine).

(6) Engine cylinder head temperature gage with warning device. (Air cooled engine).

(7) Speedometer with odometer.

(8) Tachometer.

(9) Two air pressure gages (one for each half of the brake system), low air pressure buzzer and warning light.

(10) Standard commercial engine shut down capability.

(11) Transmission temperature and oil pressure warning devices as recommended by the transmission manufacturer.

(12) Interior light switch.

(13) Alternator output gage (ammeter).

Note: Underlined portion was not addressed.

2.2 (Cont'd)

(14) Turn signal light system.

(15) Emergency flasher system.

(16) Light switch (MS52128) which controls service lights, blackout drive lights and instrument panel lights.

(17) Blackout drive lights.

(18) Glove/map box at least large enough to hold the vehicle log book.

(19) Ignition switch with an "off", "on", and "start" position manually operated without a key.

(20) Convenience outlet (24V) with incandescent plug, as a power source for portable electrical equipment.

ff. Rear view mirrors. Large full length (6" x 16") standard heavy duty west coast type outside rearview mirrors (one each side); each with a vibration free (vibration limited to provide readable definition to the truck operator) mounting shall be fixed on each side of the cab. Mirrors shall be capable of being positioned 11 feet apart such that the driver may have clear view of the payloads on the semitrailer. These mirrors shall have a combination of a flat and convex surface enclosed in a common housing. Each shall have at least 50 square inches of flat reflective area and a separate convex 25 inch to 35 inch radius of curvature surface mirror having at least 20 square inches of reflective area. Each mirror assembly shall be capable of folding against the side of the cab and also retract upon impact with brush (FMVSS 111 compliance) (MIL-T-PD-977, para 3.4.17).

gg. Wheel splash and stone throw protection. Splash shields (quarter fenders) ahead of the rear wheels and quick change anti-sail flexible mud flaps shall be installed to the rear of the rear wheels in accordance with normal commercial practice. Mud flap installations at rear wheels shall conform to the rear wheel splash and stone throw protection provisions of SAE J682. Mud flaps shall be installed to prevent mud from the inner axles from being thrown on the mirrors, back of the cab, and into the area between the back of the cab and the truck body. Mud flaps on the tractor shall be mounted to react passively without damage to flaps or semitrailer in a turning situation, and shall also be removable using only onboard hand tools (MIL-T-PD-977, para 3.4.20).

Note: Underlined portion was not addressed.

hh. Communication equipment. A space allowance and power hookup provisions must be available inside the cab convenient to the driver, for the installation of the AN/VRC-46 radio. Holes will be provided in the cab for the attachment of all items and for passage of cables through metal panels. Holes will be provided in the spare tire carrier for attachment of NSN 5820-00-740-1780 antenna support assembly for mounting of one AS-1729( )/VRC antenna. All cab holes will be filled with removable plugs or threaded fasteners. One Government furnished radio will be installed in a production vehicle to confirm space and accessibility. Subsequent radios will be troop installed (MIL-T-PD-977, para 3.4.22).

ii. The tank shall be stainless steel 304 and shall conform to the current California Air Resources Board (CARB) pressure and vacuum requirements. Carbon steel piping shall not be permitted (MIL-T-PD-977, para 3.5.2.1.1).

jj. Capacity. The tank truck must have the maximum payload compatible with the chassis capacity (2500 gallons minimum plus 3%) and transportability constraints. It must be capable of towing a M105 series trailer loaded with a pod containing 2,271 liters (600 gallons) of fuel (MOGAS, jet fuel, or diesel). It must also be capable of towing the HEMAT trailer M989 or the M345 trailer under reduced load conditions (MIL-T-PD-977, para 3.5.2.2).

kk. Workmanship. Defective components or parts and assemblies which have been repaired or modified to overcome deficiencies shall not be furnished. Welded, bolted and riveted construction utilized shall be in accordance with the standards of the industry. All components used in the assembly of the vehicle shall be new (MIL-T-PD-977, para 3.9).

Note: Underlined portions were not addressed.

2.3 Test Procedure

Limited visual and functional inspections were conducted on the M978 to ensure that no damage had incurred during shipment, and that the vehicle was in satisfactory condition for test operations. Components and assemblies were not disassembled unless a safety hazard existed. A tachograph as well as power take-off (PTO) and engine hour meters were installed.

The vehicle was serviced with the proper lubricants prior to test initiation. Inaccessibility, special tool requirements, and other relevant data were recorded. Periodic lubrications and services were performed throughout the test in accordance with the applicable manuals and lubrication order.

2.4 Test Findings

The Registration No. for the M978 tested during this CPT was NPOF6Y. Major component serial numbers are listed in Table 2-1.

2.4 (Cont'd)

TABLE 2-1. MAJOR COMPONENT SERIAL NUMBERS

Component	SN
Engine	8VF1236299087
Transmission	25101174
Transfer case	130113-U
Axle No. 1	2837200
Axle No. 2	335700
Axle No. 3	3437028
Axle No. 4	2677251
Main tank	2912

Only minor adjustments were necessary during the initial inspection. Tire pressure was adjusted to 70 psi. Wheel lug nuts were torqued to 600 lb-ft (front) and 450 lb-ft (rear). It was noted that the vehicle was not camouflage painted. The discharge line and venturi-nozzle pressure gauges that were on the vehicle were replaced with gauges supplied by TACOM. The new gauges have a metric and a standard scale whereas the old gauges have only a standard scale.

Axle spring deflection was measured during the initial and final inspections. These measurements are shown in Tables 2-2 and 2-3.

TABLE 2-2. SPRING DEFLECTION (INITIAL)

Axle Location	Left, cm	Left, in.	Right, cm	Right, in.
No. 1/2	17.5	6.9	18.1	7.1
No. 3/4	17.8	7.0	17.8	7.0

TABLE 2-3. SPRING DEFLECTION (FINAL)

Axle Location	Left, cm	Left, in.	Right, cm	Right, in.
No. 1/2	15.9	6.2	17.5	6.9
No. 3/4	16.5	6.5	16.5	6.5

The following discrepancies were noted during the final inspection:

a. Left rear towing shackle was bent beyond repair.

b. The access door to the fuel stowage box was dented in the center.

c. The fan clutch was leaking (Class I).

d. Moisture stains were in the area of the engine front main seal, but it could not be determined if they were the result of a damaged seal or the result of fluid being blown around during other operations.

e. Cracks were noted on the bulk fuel tank left support rail, muffler shield, muffler guard cap, spare tire carrier, and the left access door to the pump module.

Testing revealed the fluid passage bolt on the tow pintle was not properly machined; the V5 butterfly valve was not properly adjusted; and the bulk tank fuel level sensor was not properly calibrated.

2.5 Technical Assessment

Since the passage bolt, butterfly valve, and fuel level sensor were not properly machined, adjusted, or calibrated, the criterion in paragraph 2.2kk was not met and a shortcoming was assessed.

All other criteria were met.

3. STOWAGE

3.1 Objectives

The objectives were to determine:

a. Suitability of the stowage fixtures, brackets, and other provisions for the Basic Issue Items (BII) and Government Furnished Equipment (GFE).

b. To assure that when installed, the BII does not interfere with the crew or normal vehicle operations.

3.2 Criteria

a. Stowage. Stowage space with latching device to utilize a standard padlock will be provided to accommodate air hoses and electrical cables and items listed in paragraph 3.4.13.1 with the exception of the fire extinguisher and first aid kit which will be vehicle mounted (MIL-T-PD-977, para 3.4.13).

b. Other equipment. Each vehicle will be furnished with the following equipment except for tire chains, which will be furnished with the first two production vehicles only of each type (see para 3.5) (MIL-T-PD-977, para 3.4.13.1).

c. Hydraulic jack, 12 ton with handle for lifting the vehicle axles to exchange mounted tire assembly with properly inflated spare tire assembly (MIL-T-PD-977, para 3.4.13.1.1).

d. Wheel-nut lug wrench, with handle for wheel removal and installation (MIL-T-PD-977, para 3.4.13.1.2).

e. A fire extinguisher, complying with FMCSR 393.95. The M985 will have an additional dry chemical fire extinguisher with a 10 BC rating mounted externally. Mounting will be installed so that extinguisher is easily accessible to the operator (MIL-T-PD-977, para 3.4.13.1.3).

f. Two tire pressure gages, self contained (10 to 120 psi) suitable for checking tire pressures on the tractor, semitrailers, or trailer (MIL-T-PD-977, para 3.4.13.1.4).

g. Two pneumatic hoses, tire inflation, 55 feet long with quick disconnect couplings and necessary fittings, one hookup on each side of the vehicle, to inflate (using the chassis air system) the truck and trailer tires (MIL-T-PD-977, para 3.4.13.1.5).

h. Warning device, highway, triangular, reflective, Set of 3, Specification RR-W-1817 (MIL-T-PD-977, para 3.4.13.1.6).

i. Tools required by operator or crew for performance of operator/crew level maintenance procedures (MIL-T-PD-977, para 3.4.13.1.7).

Note: Underlined portion was not addressed.

j. First aid kit, general purpose in accordance with FMCSR 393.96, Type B. (MIL-T-PD-977, para 3.4.13.1.8).

k. Slave cable electrical for slave start from another vehicle. See paragraph 3.4.2.1 (MIL-T-PD-977, para 3.4.13.1.11).

l. Utility chain, steel alloy, 14 feet long with one grab hook and 2 coupling links with sufficient strength for vehicle recovery (MIL-T-PD-977, para 3.4.13.1.13).

m. Four towing shackles per paragraph 3.1.1.3.1 (MIL-T-PD-977, para 3.4.13.1.14).

n. Four wooden wheel chocks (MIL-T-PD-977, para 3.4.13.1.15).

o. Mounting and/or stowage provisions shall be provided for the following Government furnished equipment (GFE) (MIL-T-PD-977, para 3.4.13.1.16).

NSN	Description	Qty
5430-00-158-3807	Padlock w/Chain	2
4720-00-740-9662	Intervehicular Air Hose	1
5340-00-158-3805	Padlock w/o Chain	1
2540-00-670-2459	Pamphlet Bag	1
7510-00-889-3494	Log Book	1
5110-00-293-2336	Axe	1
5120-00-288-6574	Handle - Pick	1
5120-00-243-2395	Pick	1
5120-00-293-3336	Shovel	1
2540-00-409-8891	Bracket - Pioneer Tool	1
5120-00-265-7462	Hammer	1
5975-00-878-3791	Grounding Rods	6

p. Fire Extinguisher. The tanker truck will be equipped with two dry chemical extinguishers with a 20 B rating mounted on the exterior of the truck. Mountings will be installed so that extinguishers are easily accessible to the operator (MIL-T-PD-977, para 3.5.2.5).

3.3 Test Procedure

The BII and associated equipment were inventoried at both the initial and final inspections and checked against the shipping list and technical manual. The items were mounted on the vehicle and checked for utility, accessibility, interference, and hazards. Once this initial check was completed, the Pioneer tool rack was removed and simulated with a test weight. All other tools and equipment remained mounted on the vehicle throughout the test to further assess the durability and utility of the stowage provisions.

3.4 Test Findings

Inventory of the BII and associated equipment at the initial inspection revealed all required equipment to be present except for the intervehicular (slave) cable, and TM 9-2320-279-10HR (Hand Receipt). Stowage provisions were adequate to store all required equipment. No interference was noted between the Pioneer tool rack and the chock blocks.

Inventory of the BII and associated equipment at the final inspection revealed one 20 BC and one 10 BC fire extinguisher to be missing. All other BII was present. No damage was noted to any of the stowage provisions at the conclusion of the test that would render them non-functional.

3.5 Technical Assessment

Since the intervehicular cable was not delivered, the criteria in paragraphs 3.2b and k were not met. Even though testing of the vehicles was not adversely affected by the missing cable, it should be delivered to all fielded units. A shortcoming was, therefore, assessed.

All other criteria were met.

(Page 20 Blank)

4. PHYSICAL CHARACTERISTICS

4.1 Objective

The objective was to determine the physical characteristics of the M978.

4.2 Criteria

a. Dimensions in the unloaded condition shall be as follow (MIL-T-PD977, para 3.2.10):

(1) Overall operating height of the trucks shall not exceed 114 inches with the exception of kits per paragraphs 3.1.1.4.4 and 3.1.1.4.5.

(2) Cab and body heights less spare tire, exhaust and intake stacks are to be such that all trucks are inherently air transportable in C130 or C141 aircraft.

(3) All body types shall be height reducible for air transport. Preparation of basic vehicle for air transportation shall be accomplished in 15 minutes total or less by no more than two individuals using only common hand tools and onboard equipment. Kits are exempt from this requirement. No crane preparation is allowed. However, 120 minutes total is permitted by two individuals to prepare the M984E1 wrecker for air transportation. Equipment removed from M984 and the spare tire from the M978 may be stored directly on the aircraft.

(4) Overall vehicle width 96 inches. Minimum cargo body inside dimension between vertically mounted drop sides is 90 inches.

(5) Overall clearances. The angle of approach shall not be less than 43^{o} and the angle of departure shall not be less than 39^{o} in the area of the pintle hook.

The minimum ground clearance shall not be less than 13 inches (14 inches desirable) under the center of the axles nor less than 20 inches between the number 2 and 3 axles, loaded or unloaded and with or without a recovery winch.

b. The tanker truck, under standard operating conditions with all basic equipment, will (MIL-T-PD-977, para 3.5.2.1):

(1) Automatic bottom load with self-contained shut-off, from an exterior pump, 600 gpm (2,271 lpm) minimum, utilizing a D-1 type receptacle.

(2) Automatic bottom load with self-contained shut-off, by a PTO driven pump unfiltered fuel, 300 gpm (1,135 lpm) minimum, see paragraph 3.5.2.4.

(3) Bulk unload, by a PTO driven pump, unfiltered fuel, 300 gpm (1,135 lpm) minimum. See paragraph 3.5.2.4.

Note: Underlined portions were not addressed.

4.2 (Cont'd)

(4) Bulk unload, by a PTO driven pump, filtered fuel, 300 gpm (1,135 lpm) diesel, gasoline & jet fuel with a flow control valve. See paragraph 3.5.2.4.

(5) Gravity discharge with 4" pipe and hose, unfiltered fuel.

(6) Automotive fuel servicing PTO pump, metered, filtered fuel, w/flow control valve.

(7) Overwing aircraft fuel servicing, PTO pump, metered, filtered fuel, with flow control valve.

(8) Aircraft closed circuit refueling, and D-1, PTO pump, metered, filtered fuel, 100 gpm (378 lpm) per hose.

(9) Defuel nozzle tube and evacuate hoses with defueling capabilities.

(10) Recirculate through all lines and hoses, D-1 type receptacle in tank and D-1 type nozzle.

(11) Provide for installation of a vapor recovery kit with 4" camlock adapter IAW MIL-T-45341.

(12) Meet the requirements of NFPA-407 aircraft fuel servicing regulations where possible.

(13) Maximum system pressure not to exceed 55 psi.

(14) A gauge stick, 7/8 x 7/8 x 60" hardwood, calibrated in 50 gallon increments on one side and 100 liter increments on the other, with brass ends and a stowage tube will be provided.

c. Capacity. The tank truck must have the maximum payload compatible with the chassis capacity (2500 gallons minimum plus 3%) and transportability constraints. It must be capable of towing a M105 series trailer loaded with a pod containing 2,271 liters (600 gallons) of fuel (MOGAS, jet fuel, or diesel). It must also be capable of towing the HEMAT trailer M989 or the M345 trailer under reduced load conditions (MIL-T-PD-977, para 3.5.2.2).

d. The tanker truck will have the capability to carry at least ten 5-gallon (18.9 liters) cans of packaged lubricants, or space for six 50 ft x 2 in. collapsible hoses, three "Y" fittings and one 15 foot section of suction hose to fit the bulk discharge port. The 15-foot hose shall be provided and shall be similar to Army Drawing 11611898 but shall have a pressure rating suitable for the M978 requirements (MIL-T-PD-977, para 3.5.2.3).

Note: Underlined portions were not addressed.

4.2 (Cont'd)

e. Fuel Servicing Pump. The system shall include a PTO driven pump for automotive gasoline, diesel fuel and jet fuel. The filtered fuel delivery flow rate shall be a nominal 300 gpm with a hydraulic fluid reservoir temperature of 120 °F and shall be degraded by not more than 10% at a reservoir temperature of 180 °F with a maximum pressure differential of 10 PSIG across the filter separator, and with 0 PSIG back pressure at the discharge end of the 3 inch x 15 foot suction hose (paragraph 3.5.2.3) connected to the bulk discharge ports (MIL-T-PD-977, para 3.5.2.4).

f. Emergency Valve. Fuel servicing system shall include an emergency valve assembly which provides the means whereby fuel is not permitted to flow into the plumbing. The control for the emergency valve inside the rear module will automatically be closed when the compartment door is shut. The emergency valve is remotely opened/closed from a point allowing the operator access to the fuel servicing controls. The control shall contain a fusible section causing the valve to close in case of fire. The control shall be positioned on the extreme exterior of the vehicles to allow the operator accessibility during an emergency (MIL-T-PD-977, para 3.5.2.4.1).

g. Metering. Fuel servicing shall include a meter which provides the capability of metering filtered fuel flow from any fuel dispensing hose reel (MIL-T-PD-977, para 3.5.2.4.2).

h. Bottom Loading. Fuel servicing system shall include an automatic bottom loading method capable of accepting 600 gpm (2,271 lpm) from an external pumping source. The automatic bottom loading apparatus shall be adjusted to automatically shut off the flow of fuel into the tank when the fuel in the tank reaches capacity, plus or minus 25 gallons precluding fuel spill. The automatic level sensing device shall be of the fluid jet type (MIL-T-PD-977, para 3.5.2.4.3.1).

i. Top Loading. An opening and covering shall be provided at the top of the tank to allow rapid loading from an externally powered source (MIL-T-PD977, para 3.5.2.4.3.2).

j. Hoses and Reels. Fuel servicing system shall include a minimum of two 1-1/2 inch 50-foot (15.2 m) fuel dispensing hoses on hose reels. Each 1- 1/2 inch hose shall have a delivery capability of not less than 50 gpm (189 lpm) diesel fuel. Hose ends will be male quick disconnect. Hoses will comply with MIL-H-6615, except for static wire requirements. Two static grounding reels with 40 ft grounding cables and a ten foot long Y branch at the end, with alligator-type end connections on the end of each branch, will be provided (MIL-T-PD-977, para 3.5.2.4.5).

Note: Underlined portion was not addressed.

k. Nozzles. Two open port automotive refueling nozzles equipped with female quick disconnect are required. Fuel servicing system shall have the capability of utilizing, on both the 1-1/2 inch hoses, two open port nozzles each with spouts for aircraft servicing & motor vehicle servicing (leaded and unleaded fuel) and the closed-circuit refueling nozzles and "D-1" center point. The nozzles will be equipped with female quick disconnects and be compatible with fuel receiving ports in all fuel consuming equipment or containers (MIL-T-PD-977, para 3.5.2.4.6).

l. Filter Separator. The fuel servicing system shall include a filter separator assembly which meets the performance requirements of MIL-F-8901 (MIL-T-PD-977, para 3.5.2.4.7).

m. Sampling Probe. The vehicle must be equipped with a sampling probe on the discharge side of the filter separator for use with aqua-glow water test kit (MIL-T-PD-977, para 3.5.2.4.8).

n. Alternate Fuel Delivery Pump. A 24 volt D.C. powered pump capable of delivering a minimum of 25 gpm (95 lpm) shall be mounted in the delivery manifold and connected to the vehicle electric system. If a hose, otherwise required, is utilized for dispensing from the 24-volt pump, it shall also remain available for other uses as necessary (MIL-T-PD-977, para 3.5.2.4.9).

o. Tank Fuel Level Indicator. The tank must be equipped with a device to visible determine tank fuel level from operator ground level position (MIL-T-PD-977, para 3.5.2.4.11).

Note: Underlined portion was not addressed.

4.3 Test Procedure

TOP 2-2-500 (encl 2, ref 20), was used for general guidance in the conduct of this phase of testing.

Dimensions of the test item were determined by the use of standard mensurative instrumentation including steel tapes, straight edges, and plumb bobs.

Fuel servicing tests were conducted using weight scales, stopwatches, and vehicle supplied meters and gauges. Aircraft over wing and under wing refueling was not tested since the appropriate nozzles were not available.

4.4 Test Findings

Physical dimensions of the M978 at empty and loaded configurations are presented in Table 4-1.

4.4 (Cont'd)

TABLE 4-1. M978 PHYSICAL DIMENSIONS

Characteristic	Measured Value, cm	Measured Value, in.
Length, overall, front brushguard bolts to rear ladder	1030.6	405.8
Length, reducible, front brushguard bolts to pintle	1018.2	400.9
Width, overall, at cab door grab handles	257.3	101.3
Width, reducible, at tire bulge	257.2	101.2
Height, overall, at top of spare tire	283.5	111.6
Height, reducible, with spare tire removed, to top of tank fill port	263.2	103.6
Ground clearance, at No. 2 differential	33.2	13.1
at air tank bracket	55.8	22.0
Wheelbase, No. 1 to No. 2 axle centerline	152.4	60.0
No. 2 to No. 3 axle centerline	380.4	149.8
No. 3 to No. 4 axle centerline	152.4	60.0
Angle of approach, at towing eye, deg	41	
Angle of departure, at safety chain bracket, deg	39	

Fuel flow characteristics are presented in Table 4-2.

TABLE 4-2. FUEL FLOW CHARACTERISTICS[a]

Parameter	Flow Rate, L/min	Flow Rate, gpm
Bulk unload, by a PTO driven pump		
Filtered fuel at low idle	273.6	72.3
Filtered fuel at high idle	969.0	256.0
Unfiltered fuel at low idle	349.3	92.3
Unfiltered fuel at high idle	1,129.8	298.5
Bulk bottom load from a PTO driven pump, filtered fuel	760.8	201.0
Gravity discharge through a 3-inch line[b] with approximately 4 feet of head	584.7	154.5

TABLE 4-2 (CONT'D)

Parameter	Flow Rate, L/min	Flow Rate, gpm
Automotive fuel servicing PTO pump metered, filtered fuel, with fuel control valves to regulate flow rate:		
Hose reel No. 1	16.6 to 492.4	4.4 to 130.1
Hose reel No. 2	12.9 to 509.1	3.4 to 134.5

[a]All testing was performed on 14 and 15 June 1988 at ambient temperatures of 95 to 100 °F. The fuel and hydraulic oil temperatures were monitored during testing. Measured fuel temperatures ranged from 83 to 95 °F while the hydraulic oil reservoir temperature averaged approximately 120 °F.

[b]Due to the unavailability of a 4-inch line, a 4 to 3-inch adapter was used at the gravity feed outlet to couple to the onboard 3-inch hoses.

The electric fuel level gauge did not accurately reflect the volume of fuel inside the tank. When the tank was nearly full, verified by vehicle weighings and the calibrated wooden gauge stick, the gauge indicated that the tank was just under 3/4 full.

Operation of the automatic self-contained shut-off feature was verified during the bulk load, bottom pumping operation. The emergency fuel shut-off functioned properly and was able to be reset after use.

The pumping system discharge-line pressure gauge remained in the 50 to 55 psi range throughout the pumping operation.

Defueling the nozzle tube and evacuating hoses as well as recirculating through all lines and hoses were performed satisfactorily.

A gauge stick, 7/8 by 7/8 by 60 inch hardwood, calibrated in 50-gallon increments on one side and 100-liter increments on the other, with brass ends was provided and proved to be accurate for this type instrument.

4.5 Technical Assessment

The M978 exceeded the maximum overall width requirement of 243.8 cm (96 in.) by 13.5 cm (5.3 in.). The criterion in paragraph 4.2a(4) was not met and a shortcoming was assessed.

The angle of approach was 41° versus a requirement of not less than 43°. The criterion in paragraph 4.2a(5) was not met. This was considered minor and provided for information.

4.5 (Cont'd)
The criteria in paragraphs 4.2a(1) through (3) were met.

Since the width and angle of approach requirements were not met, the criterion in paragraph 4.2a was not met.

The maximum flow rate attained during the bulk unload operation using a PTO driven pump and unfiltered fuel was 1129.8 L/min (298.5 gpm) versus a requirement of 1135 L/min (300 gpm). The difference in flow rates is considered marginal. The criterion in paragraph 4.2b(3) was met.

The maximum flow rate attained during the bulk unload operation using a PTO driven pump and filtered fuel was 969.0 L/min (256.0 gpm) versus a requirement of 1135 L/min (300 gpm). The criterion in paragraph 4.2b(4) was not met and a shortcoming was assessed.

The bulk tank fuel level sensor was not calibrated when the vehicle was delivered. With the tank full, the level sensor indicated anywhere from one-half to three-quarters full. The criterion in paragraph 4.2o was not met and a shortcoming was assessed.

All other fuel flow requirements were met.

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5. GRADEABILITY AND SIDE SLOPE PERFORMANCE

5.1 Objective

The objective was to determine the operational capability of the payloaded M978 on longitudinal and side slopes.

5.2 Criteria

a. Speed and gradeability (MIL-T-PD-977, para 3.3.1).

(1) Vehicles with applicable towed trailer and/or semitrailer respectively shall start on and climb a 30% grade at GCW (adequate traction assumed). If a torque converter is provided, the vehicle must start and after initial acceleration climb the grades specified while maintaining the converter efficiency factor established by the manufacturer for continuous duty. If a torque converter is not provided, the vehicle must be capable of starting on a 30% grade without deviating from normal starting procedures. Vehicle shall have gearing and torque capable of meeting the minimum gradeability requirements. Note: Gradeability shall be met using Class I good roads per SAE J688.

(2) Vehicle of the type chassis without towed load, body types A, B, C, and D shall be further capable of starting on and climb (in forward direction) a 60% grade at GVW (adequate traction assumed). This shall be a performance rather than a durability requirement. If a torque converter is provided the vehicle must start and after initial acceleration climb the grades specified while maintaining the converter efficiency factors established by the manufacturer for continuous duty. If a torque converter is not provided, the vehicle must be capable of starting on a 60% grade without deviating from normal starting procedures. Vehicle shall have gearing and torque capable of meeting the minimum gradeability requirements. Note: Gradeability shall be met using Class I good roads per SAE J688.

(3) Vehicles shall maintain speeds on Class I good roads (per SAE J688 and J816) on a 3% grade as follows (if a multi-speed transfer case is provided this performance must be in high range or direct drive range):

(a) Type I, III, IV, and V chassis, with full trailer, 100,000 lbs. GCW: 25 mph.

(b) Type II chassis, tractor with semitrailer, 100,000 lbs. GCW: 25 mph.

(c) Type I, III, IV, and V chassis, truck only 60,000 lbs. GVW: 40 mph.

(4) Vehicle shall be capable of maintaining sustained speeds on Class I good roads (per SAE J688 and J816) on a 2% grade as follows:

(a) Type I, III, IV, and V chassis, with full trailer, 100,000 lbs. GCW: 35 mph.

(b) Type II chassis, tractor with semitrailer, 100,000 lbs. GCW: 35 mph.

(c) Type I, III, IV, and V chassis, truck only, 60,000 lbs. GVW; 50 mph.

(5) Each vehicle shall be capable of maintaining sustained speeds on level Class I good roads (per SAE J688) of not less than 55 mph at the GCW.

Vehicles shall meet above requirements based upon calculations in accordance with SAE J688 and J816 using the factors contained in paragraph 6.5, Truck Ability Prediction Procedures, using class of roads specified above.

b. Side slope operation. All vehicle types without towed load shall be capable of operation headed up and headed down slope on longitudinal grades as specified in paragraph 3.3.1 and side slopes up to 30% with each side of the vehicle up slope. As a result of the operation, no evidence of faulty lubrication, leakage or other malfunction shall be found (MIL-T-PD-977, para 3.3.3).

c. Service brakes. Service brakes shall meet the requirements of Section 393.52 of Federal Motor Carrier Safety Regulations and Department of Transportation Regulations for heavy duty trucks (FMVSS121). The service brakes will also stop and hold the truck on a 60% grade on dry concrete when the truck is loaded to its GVW, pointing either uphill or downhill (MIL-T-PD-977, para 3.3.4).

d. Parking brake. A parking shall be furnished and shall conform to the Federal Motor Carrier Safety Regulation 393.41 and hold its own GVW on a 20% grade (40% desirable), pointing either uphill or downhill (MIL-T-PD-977, para 3.3.5).

Note: Underlined portions were not addressed on this subtest.

5.3 Test Procedure

TOP 2-2-610 (encl 2, ref 25), was used for general guidance in the conduct of this phase of testing.

The payloaded M978 was operated both up and down hard-surfaced longitudinal slopes located in the Munson Test Area. Engine operation, engine restart, and service and parking brake holding capabilities were tested.

The payloaded vehicle was also operated on concrete 20 and 30% side slopes. Engine operation, engine restart, and a sine-wave pattern of operation were checked with both the right and left sides of the vehicle upslope.

5.4 Test Findings

The vehicle was able to ascend and descend, both in the forward and reverse directions, longitudinal grades up to and including 60%. However, during the initial attempt to hold the vehicle on the 60% grade after ascending the grade one vehicle length in the forward direction, the U-joint between the transfer case and the No. 3 differential broke. While descending the 15% grade, fuel was observed to be leaking from the overpressure relief valve located at the top front of the tank. The leakage rate increased as the vehicle was driven onto progressively steeper grades. While on the 60% grade, the leak was a steady Class III.

Maximum sustained speeds while ascending the longitudinal grades were measured and are presented in Table 5-1.

TABLE 5-1. MAXIMUM SUSTAINED SPEEDS ON LONGITUDINAL GRADES

Grade, %	Road Speed km/hr	Road Speed mph	Engine Speed, rpm
5	47.3	29.4	2080
10	30.0	18.6	2160
15	24.0	14.9	2080
20	16.3	10.1	2150
30	10.0	6.2	2000
40	9.4	5.8	2200
50	8.4	5.2	2000
60	6.0	3.7	2180

The service brakes were able to hold the vehicle on the 60% grade in both the forward and reverse directions. The parking brake system was able to hold the vehicle on longitudinal grades up to and including 40% in both the forward and reverse directions.

The M978 was able to negotiate the 30% side slope in a sinusoidal wave pattern with both the left and right side uphill.

While on the 60% longitudinal grade and the 30% side slope, the engine was shut down and successfully restarted after 2 minutes.

5.5 Technical Assessment

The M978 was capable of starting on and climbing (in the forward direction) a 60% longitudinal grade at GVW. The criterion in paragraph 5.2a was met.

5.5 (Cont'd)

The loaded M978 did satisfactorily negotiate the 20 and 30% side slopes; engine operation, restart, and steering performance were also satisfactory. However, on longitudinal grades steeper than 15%, fuel was noted to be leaking from the overpressure relief valve at the top front of the tank with no provisions to reroute the fuel away from the engine compartment. The criterion in paragraph 5.2b was, therefore, not met and a deficiency was assessed (Class II-C safety hazard).

Service brake holding ability was satisfactory on the 60% grade with the vehicle loaded to its GVW and pointed both up and downhill. The criterion in paragraph 5.2c was met.

Parking brake holding ability was satisfactory on grades up to and including 40%. The criterion in paragraph 5.2d was met.

6. STEERING AND TURNING

6.1 Objective

The objective was to determine the steering characteristics of the M978.

6.2 Criterion

Vehicle clearance circle. Each vehicle clearance shall not exceed six times the vehicle wheelbase when measured per SAE J695 but in no case will turning diameter (curb-to-curb) exceed 100 feet. The type II chassis with M860 and M790 semitrailers in road march configuration shall be able to negotiate a right angle turn posed by an intersection of two road beds 24 feet wide (wall to wall) without stopping. Stopping/backing is allowed in negotiations of the above turn with M986 trailer in tow (MIL-T-PD-977, para 3.2.13).

Note: Underlined portion was not addressed.

6.3 Test Procedure

TOP 2-2-609 (encl 2, ref 37), Steering, was used for general guidance in the conduct of this phase of testing.

Maximum full right and left turns were conducted with the payloaded M978 to determine minimum turning diameters. These turns were made on a level concrete surface.

During the above-mentioned tests, standard mensurative instrumentation was used including steel tapes, plumb bobs, protractors, and a Rolatape model 415 distance-measuring wheel (accuracy ±1 ft).

6.4 Test Findings

Wall-to-wall and curb-to-curb turning diameters of the M978 are presented in Table 6-1.

TABLE 6-1. M978 MINIMUM TURNING DIAMETERS

	Left		Right	
Parameter	m	ft	m	ft
Curb-to-curb	29.1	95.4	28.1	92.2
Wall-to-wall	31.0	101.8	29.9	98.0

Dead engine steering maneuvers were performed on a secondary road surface at various speeds up to 64 km/hr (40 mph). Following engine shutdown, vehicle steering ability was maintained. Although slightly more effort was required to steer the vehicle, the required force was not considered excessive.

6.5 Technical Assessment

The curb-to-curb turning diameter of the M978 was less than the requirement of 30.5 meters (100 ft). The criterion in paragraph 6.2 was met.

7. TIE-DOWN AND SLING PROVISIONS

7.1 Objective

The objective was to determine whether tie-down eyes and lift provisions on the M978 were sufficient for the vehicle to be tied down and lifted when being transported.

7.2 Criteria

a. Transportability. Vehicles shall be equipped with lifting, towing, and tie-down devices which shall be adequate for highway, rail, sea, and air transport, in accordance with MIL-STD-209 and MIL-A-8421. Each type of truck with full load (less trailer) shall be capable of being transported by highway trailer, rail, and ocean carrier. The trucks are to be air transportable unloaded on C130, C141, and C5A per paragraphs 3.2.10 and 3.4.10.2 (MIL-T-PD977, para 3.1.1.3).

b. Towing eyes. Two towing eyes shall be furnished and installed on the front of each vehicle and two towing eyes shall be furnished and installed on the rear of each vehicle. Each towing eye and its mounting shall withstand a load of at least 60,000 pounds without failure or permanent deformation when the load is applied at an angle up to 45 degrees from the longitudinal axis. The towing eyes shall be of a size such that the vehicle can be towed with the medium duty towbar described in MS-500048. Towing shackles shall be provided with the towing eyes. Front tow eyes will be located in the vertical plane of the frame side rails. Protrusion of the tow eyes into the 43° angle of approach plane is permitted (MIL-T-PD-977, para 3.1.1.3.1).

c. Pintle. A towing pintle at the rear of the vehicle shall be furnished. The pintle assembly shall be of the swivel type and conform to the size and strength described in MS-51117. The assembly shall be furnished with mounting flanges and lubrication fitting. The pintle assembly mounting surface shall be forward but not more than 4 inches forward of the rear most part of the vehicle. The mounting of the pintle assembly shall include reinforcements to transfer pintle loads directly to the web of the chassis frame. Provision for attachment of trailer safety chains shall be provided as per SAE J849 (per truck installation note) for single axle trailers to be compatible with the M989 trailer which requires a one inch safety chain bracket pin. Pintle height shall be 35 inches $\pm$3 inches from the ground with the truck loaded to its rated cargo capacity. Pintle height shall be appropriate to accommodate the following trailers with towbar height inches as listed: M105 (34-1/4), M149 (30 - 41), M332 (33-3/8), HEMAT (33-1/2 - 40) (MIL-T-PD-977, para 3.1.1.3.2).

d. Tie-downs. Complete diagrams for lifting and tying down the trucks for the various transport modes shall be provided. Instructions shall be included for component removal when required for transport. Stencil or decal markings shall be applied to the vehicles at each lifting and tie-down point, conforming to MIL-STD-209. The tie-downs shall permit tie-down of the vehicles to the floor (or deck) of the transport medium in such a manner as to prevent shifting or movement in any direction (MIL-T-PD-977, para 3.1.1.3.3).

Note: Underlined portions were not addressed.

7.3 Test Procedure

The tie-down provisions of the M978 were tested in accordance with MIL-STD-209G (encl 2, ref 11), by using an M88 recovery vehicle to apply the longitudinal and lateral loads to the eyes. Vertical loads were applied to the eyes by means of an hydraulic jack. Required tie-down loads were calculated based on the tie-down diagram provided. The loads applied were measured by means of a calibrated load cell and readout (accuracy ±1%). Following application of the required loads, the tie-down provisions and mounting areas were visually inspected for permanent deformation or damage.

The required loads, cable lengths, cable angles, and apex height were calculated for the lifting provision test based on the center of gravity location and GVW.

7.4 Test Findings

Results of the tie-down test are presented in Table 7-1.

TABLE 7-1. M978 TIE-DOWN PROVISION CHECK

Provision Location	Direction Load Applied	Load			
		Required		Applied	
		kN	lb	kN	lb
Left front	Longitudinal	266.9	60,000	266.9	60,000
Left rear	Longitudinal	266.9	60,000	266.9	60,000
Pintle	Longitudinal	189.5	42,608	191.3	43,000
Left front	Lateral	71.1	15,978	71.2	16,000
Right front	Lateral	71.1	15,978	71.2	16,000
Left rear	Lateral	71.1	15,978	71.2	16,000
Right rear	Lateral	71.1	15,978	71.2	16,000
Left front	Vertical	52.6	11,835	53.4	12,000
Right front	Vertical	52.6	11,835	53.4	12,000
Left rear	Vertical	52.6	11,835	53.4	12,000
Right rear	Vertical	52.6	11,835	53.4	12,000
Left inter	Vertical	52.6	11,835	53.4	12,000
Right inter	Vertical	52.6	11,835	53.4	12,000
Pintle	Vertical	52.6	11,835	53.4	12,000

No damage or deformation was noted on any of the tie-down provisions following application of the required loads. It should be noted that the intermediate provisions could not be subjected to the required longitudinal and lateral loads due to interference with the vehicle wheels.

Results of the lift provision test are presented in Table 7-2.

TABLE 7-2. LIFTING PROVISION CHECK

Parameter	Required	Measured
Total vertical load, kN (lb)	280.7 (63,100)	-
Component force applied to the left front provision, kN (lb)	206.2 (46,350)	213.1 (47,900)
Component force applied to the right rear provision, kN (lb)	141.2 (31,750)	159.2 (35,800)
Sling apex height, m (ft)	≤ 7.3 (24)	5.9 (19.3)
Front cable angle, deg (relative to horizontal)	≥ 45	47
Rear cable angle, deg (relative to horizontal)	≥ 45	60

No damage or deformation was noted on any of the lifting provisions or the vehicle following application of the required loads.

While attempting to lubricate the fluid passage bolt on the tow pintle hatch assembly during a scheduled service, it was discovered that the bolt grease fitting would not take grease. An inspection of the bolt revealed the fluid passage, which extends down the length of the bolt, was not drilled deep enough. The fluid passage bolt was then drilled out to allow the fitting to accept grease.

7.5 Technical Assessment

Based on the results of Tables 7-1 and 7-2, the M978 tie-down and lift provisions did satisfactorily meet the requirements of MIL-T-PD-977 and MIL-STD-209G with respect to withstanding the forces applied without deformation or damage. The criteria in paragraphs 7.2a and 7.2b were met.

A towing pintle was provided that met the requirements of MIL-T-PD-977. Improper machining of the fluid passage bolt was classified as a quality defect, shortcoming. The criterion in paragraph 7.2c was met.

Complete diagrams for lifting and tying down the vehicle were provided. The criterion in paragraph 7.2d was met.

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8. WEIGHT DISTRIBUTION AND GROUND PRESSURE

8.1 Objective

The objective was to determine weight distribution of the M978 at various conditions.

8.2 Criterion

Axle weight distribution, as specified in MIL-A-8421 for the C130/C141, shall be obtainable without disassembly (other than those items specified in para 3.2.10c) (MIL-T-PD-977, para 3.2.10.8).

Note: Underlined portion was not addressed.

8.3 Test Procedure

TOP 2-2-801 (encl 2, ref 24), was used for general guidance in the conduct of this phase of testing.

Weight distribution was determined by sequential weighings on calibrated platform scales (accuracy ±0.5% reading).

8.4 Test Findings

The individual wheel weight distribution with the vehicle at curb weight and gross vehicle weight (GVW) (fuel tank filled) are presented in Tables 8-1 and 8-2.

TABLE 8-1. M978 WEIGHT DISTRIBUTION, CURB WEIGHT

Wheel Location	Left Side		Right Side		Total	
	kg	lb	kg	lb	kg	lb
1	2,440	5,380	2,500	5,500	4,940	10,880
2	2,630	5,800	2,600	5,740	5,230	11,540
3	1,950	4,300	1,840	4,060	3,790	8,360
4	1,850	4,080	1,750	3,860	3,600	7,940
Total	8,870	19,560	8,690	19,160	17,560	38,720

TABLE 8-2. M978 WEIGHT DISTRIBUTION, GVW

Wheel Location	Left Side		Right Side		Total	
	kg	lb	kg	lb	kg	lb
1	2,940	6,480	3,060	6,740	6,000	13,220
2	3,230	7,120	3,170	6,980	6,400	14,100
3	3,230	7,120	3,090	6,820	6,320	13,940
4	3,160	6,960	3,000	6,620	6,160	13,580
Total	12,560	27,680	12,320	27,160	28,880	54,840

8.5 Technical Assessment

Based on the weight distribution results, the criterion in paragraph 8.2 was met.

9. BRAKING

9.1 Objective

The objective was to determine service and parking-brake characteristics of a payloaded M978.

9.2 Criteria

a. Brakes. Brakes shall conform to Federal Motor Carrier Safety Regulations 393.40 through 393.42(b), 393.43, and 393.45 through 393.52. The performance of the brake system shall comply with FMVSS-121 except that the anti-lock system shall not be furnished. All brakes will be releaseable from the cab in the tactical environment in the event of emergency lockup. The rear axle brakes shall be at least 16-1/2 inches by 7 inches in size and compatible with a rear tandem off-road load rating of 38,000 pounds (MIL-T-PD-97, para 3.4.9).

b. Service brakes. Vehicle shall be equipped with air brakes. Air/hydraulic combination also permissible, if in conjunction with "S" cam type axles and disc type brakes. Brake apply cylinder/"cams" and the associated lines shall be located to minimize exposure to "road hazards" or cause reduced ground clearance. The braking system shall be complete with all necessary components and include: (MIL-T-PD-977, para 3.4.9.1).

(1) Split apply circuitry. The service brake system shall be designed to employ two separate apply circuits which normally apply simultaneously. The split may be on a wheel by wheel basis (two apply devices per wheel with each device coupled to one of the separate circuits). Each circuit is protected from leaks elsewhere by check valves providing emergency stopping capability. No air will be sued directly from the "wet" tank except for the governor pressure signal. Air for all accessories will be taken from one tap on either one of the apply circuit reservoirs and that tap will be provided with a shut off valve (MIL-T-PD-977, para 3.4.9.1.2).

(2) Air storage reservoirs). Capacity shall comply with FMVSS-121 requirements. The tank shall be equipped with a drain valve, safety valve, and check valve between compressor and last reservoir tank (MIL-T-PD-977, para 3.4.9.1.2).

(3) Foot control - suspended or treadle type (MIL-T-PD-977, para 3.4.9.1.3).

(4) Air pressure gage for each apply circuit, visible to the driver (MIL-T-PD-977, ,para 3.4.9.1.4).

Note: Underlined portions were not addressed.

(5) Low air pressure warning buzzer and light (MIL-T-PD-977, para 3.4.9.1.5).

(6) The wet tank shall be equipped with a drain valve that is readily accessible from the side of the vehicle (MIL-T-PD-977, para 3.4.9.1.7).

(7) Air control valves (MIL-T-PD-977, para 3.4.9.1.8).

(8) Desiccant type air dryer system and automatic drain valve(s) shall be provided (MIL-T-PD-977, para 3.4.9.1.9).

(9) Provisions for two "glad hands" at both the front and rear of the vehicle to permit a towing vehicle to supply air to the reservoirs on the towed vehicle and to apply the towed vehicles brakes (MIL-T-PD-977, para 3.4.9.1.10).

9.3 Test Procedure

TOP 2-2-608 (encl 2, ref 38), was used as a general guide in the conduct of this test.

The M978 braking capability was determined by measuring the distances required to stop from road speeds of approximately 32 to 64 km/hr (20 to 40 mph) when using the service brakes at maximum pedal effort.

9.4 Test Findings

Maximum pedal effort braking characteristics of the M978 are presented in Table 9-1.

TABLE 9-1. MAXIMUM PEDAL EFFORT BRAKING CHARACTERISTICS

Road Speed		Stopping Distance		Remarks	
km/hr	mph	m	ft		
32.4	20.1	9.6	31.5	Rear bogie locked up.	Stopped straight.
32.8	20.4	10.0	32.8	Rear bogie locked up.	Stopped straight.
32.7	20.3	9.7	31.8	Rear bogie locked up.	Stopped straight.
32.5	20.1	9.4	30.8	Rear bogie locked up.	Stopped straight.
32.9	20.4	9.9	32.5	Rear bogie locked up.	Stopped straight.
32.7	20.3	9.7	31.8	Average values.	
63.6	39.5	35.6	116.7	Rear bogie locked up.	Slew 3 to 4 ft right.
63.7	39.6	36.4	119.3	Rear bogie locked up.	Slew 3 to 4 ft right.
64.2	39.9	37.4	122.6	Rear bogie locked up.	Stopped straight.
64.0	39.8	36.6	120.0	Rear bogie locked up.	Stopped straight.
64.9	40.3	36.9	121.0	Rear bogie locked up.	Stopped straight.
64.2	39.9	34.8	114.1	Rear bogie locked up.	Slew 3 to 4 ft right.
64.2	39.9	36.1	118.4	Rear bogie locked up.	Slew 3 to 4 ft right.
64.1	39.8	36.3	119.0	Average values.	

9.5 Technical Assessment

As tested, the service and parking brake characteristics of the M978 were satisfactory. The physical characteristics of the service brake system complied with the requirements in paragraph 9.2b. The criteria in paragraphs 9.2a and b were met.

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10. ACCELERATION: MAXIMUM AND MINIMUM SPEEDS

10.1 Objective

To determine acceleration characteristics and maximum and minimum speeds of the M978 vehicle.

10.2 Criteria

a. Speed and gradeability (MIL-T-PD-977, para 3.3.1).

(1) Vehicles with applicable towed trailer and/or semitrailer respectively shall start on and climb a 30% grade at GCW (adequate traction assumed). If a torque converter is provided the vehicle must start and after initial acceleration climb the grades specified while maintaining the converter efficiency factor established by the manufacturer for continuous duty. If a torque converter is not provided the vehicle must be capable of starting on a 30% grade without deviating from normal starting procedures. Vehicle shall have gearing and torque capable of meeting the minimum gradeability requirements. Note: gradeability shall be met using Class I good roads per SAE J688.

(2) Vehicle of the Type chassis without towed load, body types A, B, C, and D shall be further capable of starting on and climb (in forward direction) a 60% grade at GVW (adequate traction assumed). This shall be a performance rather than a durability requirement. If a torque converter is provided the vehicle must start and after initial acceleration climb the grades specified while maintaining the converter efficiency factors established by the manufacturer for continuous duty. If a torque converter is not provided, the vehicle must be capable of starting on a 60% grade without deviating from normal starting procedures. Vehicle shall have gearing and torque capable of meeting the minimum gradeability requirements. Note: Gradeability shall be met using Class I good roads per SAE J688.

(3) Vehicles shall maintain speeds on Class I good roads (per SAE J688 and J816) on a 3% grade as follows (if a multi-speed transfer case is provided this performance must be in high range or direct drive range):

(a) Type I, III, IV, and V chassis, with full trailer, 100,000 lbs GCW: 25 mph.

(b) Type II chassis, tractor with semitrailer, 100,000 lbs GCW: 25 mph.

(c) Type I, III, IV, and V chassis, truck only 60,000 lbs GVW: 40 mph.

(4) Vehicles shall be capable of maintaining sustained speeds on Class I good roads (per SAE J688 and J816) on a 2% grade as follows:

(a) Type I, III, IV, and V chassis, with full trailer, 100,000 lbs GCW: 35 mph.

(b) Type II chassis, tractor with semitrailer, 100,000 lbs GCW: 35 mph.

(c) Type I, III, IV, and V chassis, truck only, 60,000 lbs GVW: 50 mph.

(5) Each vehicle shall be capable of maintaining sustained speeds on level Class I good roads (per SAE J688) of not less than 55 mph at the GCW.

Vehicles shall meet above requirements based upon calculations in accordance with SAE J688 and J816 using the factors contained in 6.5, Truck Ability Prediction Procedures, using class of roads specified above.

b. Governed speed. Maximum geared speed at engine full-load governed speed shall be not less than 55 mph for Types I through V vehicles. Engine governed speed will not exceed the maximum rpm rating specified by the engine manufacturer (MIL-T-PD-977, para 3.3.2).

Note: Underlined portions were not addressed.

10.3 Test Procedure

Data were obtained by means of a pulse code modulation (PCM) data acquisition system.

Acceleration characteristics, minimum speed, and maximum speed were measured with the M978 fully payloaded.

Accelerations were determined with the M978 vehicle at GVW, transmission in drive.

The maximum, average road speed was determined in conjunction with the above tests.

Minimum road speed was also determined, with the vehicle in low-first gear.

10.4 Test Findings

Minimum speed was measured to be 2.8 km/hr (1.7 mph) at 685 rpm. Maximum speed was measured to be 100.0 km/hr (62.1 mph) at 2240 rpm. Average elapsed times required to accelerate to specific road speeds are presented in Table 10-1.

TABLE 10-1. ACCELERATION CHARACTERISTICS

Road Speed km/hr	Road Speed mph	Time, sec
8	5	1.6
16	10	3.2
24	15	4.9
32	20	7.5
40	25	10.6
48	30	13.9
56	35	19.6
64	40	24.6
72	45	32.1
80	50	43.2

10.5 Technical Assessment

The M978 was capable of attaining a maximum speed of 100.0 km/hr (62.1 mph). The criteria in paragraphs 10.2a and b were met.

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11. SELF-RECOVERY WINCH CAPABILITY

11.1 Objective

The objective was to determine the operational characteristics of the vehicle self-recovery winch and associated hardware.

11.2 Criterion

The vehicle shall be equipped with a winch for self-recovery for both forward and rearward deployment. The winch shall be driven by a hydraulic motor mounted directly on the winch. The winch installation shall not decrease vehicle approach or departure angles or the ground clearance of the vehicle. The winch shall provide a minimum line pull of 20,000 pounds from a bare drum with a minimum line speed of 15 ft/min from a bare drum. The winch cable shall be at least 200 feet in length, with a safety factor of 50 percent above maximum line pull capacity. A pressure relief valve shall be provided to limit winch overloading to 110% maximum line pull. End of wire rope will be equipped with clevis end. Roller or sheave assemblies shall be located at the front and rear of the vehicle to guide the cable. Winch shall be controllable from the driver's position. All controls shall be of the dead man type that will revert to neutral when released. A snatch block shall be provided with this truck to permit using a two part line. Means of securing the snatch block to a tree shall be provided. Stowage provisions for this hardware shall be provided. The winch design shall be in compliance with SAE J706. The maximum continuous rating shall be such that 2 (two) successive 100 ft line pulls can be accomplished at 90 percent of maximum torque necessary to exert a 20,000 lb line pull on the bottom layer of cable without exceeding a lube oil temperature of 250 ^{o}F or damaging the safety brake at 120 ^{o}F ambient. A tension mechanism to assist in level rewind shall be provided (MIL-T-PD-977, para 3.5.1.3).

Note: Underlined portion was not addressed.

11.3 Test Procedure

TOP 2-2-712 (encl 2, ref 30) was used as a guide for the testing procedure.

Compliance to the test criteria was determined by visual inspection and initial operation of the self-recovery winch system.

The overall length and diameter of the winch cable (wire rope) for the self-recovery winch was measured and other relevant winch characteristics were noted.

11.4 Test Findings

The physical characteristics of the self-recovery winch mounted on vehicle No. NPOF6Y are presented in Table 11-1.

TABLE 11-1. SELF-RECOVERY WINCH CHARACTERISTICS

Characteristic	Measured Value
Spool diameter, cm (in.)	27.0 (10.6)
Cable diameter, cm (in.)	1.6 (0.6)
Cable length, m (ft)	61.1 (200.5)
Usable cable length, from rear, (with 3 wraps on spool), m (ft)	55.1 (180.7)

Maximum line pulls and pulls at 90% of the maximum rated load were made in each direction. Calculated loads applied during the 90% maximum load pulls are presented in Table 11-2.

TABLE 11-2. CALCULATED 90% MAXIMUM RATED LOADS

No. of Layers	Measured Spool Diameter		Calculated 90% of Max Rated Load	
	cm	in.	kN	lb
0	27.00	10.63	80.1	18,000
1	29.54	11.63	75.2	16,900
2	32.08	12.63	69.8	15,700
3	34.29	13.50	64.9	14,600
4	36.83	14.50	60.5	13,600
5	39.37	15.50	56.0	12,600

The results from the maximum stall pulls and from the 90% maximum rated load pulls are summarized in Table 11-3.

TABLE 11-3. WINCH STALL PULL AND 90% MAXIMUM RATED LOAD PULL RESULTS

Type of Pull	Dir. of Pull	No. of Layers	Meas. Force kN	Meas. Force lb	Line Speed m/min	Line Speed fpm	Ambient Temp °C	Ambient Temp °F	Hydraulic Reservoir Temp At Start °C	Hydraulic Reservoir Temp At Start °F	Hydraulic Reservoir Temp At End °C	Hydraulic Reservoir Temp At End °F
Maximum stall[a]	Front	Bare drum with 3 wraps	92.5	20,800	NA		31	87	42	108	45	113
Maximum stall[a]	Rear	Bare drum with 3 wraps	98.5	22,150	NA		25	77	-	-	-	-
90% max rated	Front	0 to 5	See Table 11-2		8.1	26.5	32	89	45	113	68	155
90% max rated	Front	0 to 5	See Table 11-2		8.0	26.3	32	89	76	168	93	200
90% max rated	Rear	0 to 5	See Table 11-2		7.9	26.1	25	77	-	-	-	-

[a]Maximum line pull was limited by the safety overpressure valve.

Two successive pulls were accomplished at 90% maximum rated load. At the end of the second pull, the hydraulic reservoir temperature was 93 °C (200 °F).

11.5 Technical Assessment

The physical and operational characteristics of the self-recovery winch were satisfactory; the criterion in paragraph 11.2 was met.

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12. TOXIC FUMES

12.1 Objective

The objective was to determine the adequacy of the exhaust system and identify any safety hazards from toxic gas concentrations in the operator's compartment and refueling station relating to engine operation.

12.2 Criterion

Exhaust system. The exhaust system shall conform to Federal Motor Carrier Safety Regulation 393.83. The exhaust system as installed shall be gas tight and leakproof to prevent the accumulation of exhaust gas in the occupied areas in accordance with best commercial practice. The preferred tail pipe(s) location shall be a vertical stack at the rear of the cab. The tail pipe(s) shall be configured to prevent entry of rain water when vehicle is not operating. Exhaust mufflers and tail pipes shall be corrosion resistant and shall be furnished with adequate guards to prevent personnel contact while operating winches and other equipment mounted, or intended to be mounted, entering and exiting the cab, and normal entry and exit of rear deck (MIL-T-PD-977, para 3.4.4).

Note: Underlined portion was not addressed.

12.3 Test Procedure

Moving and stationary trials were conducted to determine if toxic fume hazards existed. During all moving trials, the driver's and passenger's seat were monitored for CO, NO_2, and SO_2 using hand held monitors. During all stationary trials, the pumping station as well as the driver's and passenger's seats were monitored.

The Minico V CO analyzer operates on the principle of the sample being introduced to the sensor by diffusion through a Teflon membrane located on the bottom of the monitor. The sensor is an electrochemical polargraphic cell which electro-oxidizes CO to CO_2 in proportion to the partial pressure of CO in the sample area. The resulting electrochemical signal is amplified, temperature compensated, microprocessed and displayed. The unit is also equipped with a dosimeter function which allows for continuous monitoring for 6 months or 1999 ppm-hr. The maximum error associated with the unit is $\pm$7.5% of the reading over the temperature range of 0 to 40 ^{o}C with a minimum detectable concentration of 1 ppm.

The Sensidyne mini-monitors are area detectors that continuously monitor for NO_2 and SO_2. A liquid crystal display (LCD) reads out the concentrations in ppm which is detected by an electrochemical sensor. Additionally, audio and visual alarms are provided when the concentrations exceed the alarm set points. Since the Sensidyne monitors do not contain dosimeter functions, the concentrations of NO_2 and SO_2 were assessed on a pass/fail basis.

Four distinct stationary trials were conducted with the vehicle positioned such that the wind was blowing toward each side of the vehicle. Moving trials were conducted at 24.1 km/hr (15 mph) and 48.2 km/hr (30 mph). Each trial was 30 minutes long and was conducted with the doors closed and the heater off.

Results of the toxic fumes test were compared to the OSHA criteria for acceptability. These criteria are listed in Table 12-1.

TABLE 12-1. OSHA CRITERIA

Compound	Permissible Exposure Limit Concentration, ppm	Maximum Allowable Concentration, ppm
CO	50	NA
NO_2	5	5
SO_2	5	NA

12.4 Test Findings

A summary of the test results is shown in Table 12-2.

TABLE 12-2. TOXIC FUMES TEST RESULTS[a]

Condition	Position	Wind Direction	Wind Speed, mph	CO TWA, ppm	CO Peak, ppm	NO_2	SO_2
Moving - 15 mph	Driver	NA	NA	3	1.6	Pass	Pass
Moving - 15 mph	Driver	NA	NA	5	2.4	Pass	Pass
Moving - 15 mph	Passenger	NA	NA	3	2.8	Pass	Pass
Moving - 15 mph	Passenger	NA	NA	4	3.0	Pass	Pass
Moving - 30 mph	Driver	NA	NA	6	5.2	Pass	Pass
Moving - 30 mph	Driver	NA	NA	6	4.6	Pass	Pass
Moving - 30 mph	Passenger	NA	NA	7	5.0	Pass	Pass
Moving - 30 mph	Passenger	NA	NA	7	5.0	Pass	Pass
Stationary	Driver	Front	2	7	3.8	Pass	Pass
Stationary	Driver	Front	2	6	5.4	Pass	Pass
Stationary	Pumping station	Front	5	5	0.0	Pass	Pass
Stationary	Pumping station	Front	5	4	3.6	Pass	Pass
Stationary	Driver	Right	8 to 10	14	7.8	Pass	Pass
Stationary	Driver	Right	8 to 10	8	6.4	Pass	Pass
Stationary	Pumping station	Right	8 to 10	4	2.6	Pass	Pass
Stationary	Pumping station	Right	8 to 10	4	2.8	Pass	Pass

TABLE 12-2 (CONT'D)

Condition	Position	Wind Direction	Wind Speed, mph	CO TWA, ppm	CO Peak, ppm	NO_2	SO_2
Stationary	Driver	Rear	10 to 12	8	6.4	Pass	Pass
Stationary	Driver	Rear	10 to 12	9	7.6	Pass	Pass
Stationary	Pumping station	Rear	10 to 12	5	0.0	Pass	Pass
Stationary	Pumping station	Rear	10 to 12	4	3.2	Pass	Pass
Stationary	Driver	Left	8 to 10	7	5.6	Pass	Pass
Stationary	Driver	Left	8 to 10	6	5.8	Pass	Pass
Stationary	Pumping station	Left	8 to 10	3	2.6	Pass	Pass
Stationary	Pumping station	Left	8 to 10	3	2.8	Pass	Pass

[a]Moving trials were conducted with the doors closed and the heater off. Stationary trials were conducted with the doors closed, heater off, PTO on, and engine at 1500 rpm.

The tail pipe is a vertical stack located at the rear of the cab and is configured to prevent entry of rain water when the vehicle is not operating.

12.5 Technical Assessment

Since the peak CO concentrations were below the OSHA criteria and the NO_2 and SO_2 concentrations were acceptable, the criterion in paragraph 12.2 was met.

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13. FORDING

13.1 Objective

To determine the shallow-water fording ability of the M978.

13.2 Criterion

The vehicle, without prior preparation, shall ford hard-bottom water crossings to a depth of 48 inches for not less than 5 minutes duration without damage or additional maintenance prior to further operation, and no contamination or lubricants in those enclosures which are designed to exclude contaminates. Pressurization of the air braking system to meet the fording requirement is allowed. Spring loaded vent valves shall be used on all axle housings (MIL-T-PD-977, para 3.3.6).

13.3 Test Procedure

Prior to and after fording the M978 in 121.9 cm (48 in.) of water, lubricant samples were taken to determine if seals and plugs were suitable to prevent excessive leakage of water into engine, transmission, transfer, hydraulic system, and differentials.

The vehicle was driven into the Munson area fording basin, idled for 2 minutes, shut down for 2 minutes, then restarted and idled for 1 minute. After the 5-minute fording test, a brake stop was made from a road speed of 32.2 km/hr (20 mph) to determine the effect of shallow-water fording. The vehicle was then driven a total of 8 km (5 mi) to determine if the power train was affected by the submersion.

13.4 Test Findings

Engine, hydraulic system, and power-train lubricants were not contaminated by water.

Water leaked into the cab floor around both the left and right door seals. The water accumulated to a depth of 5.1 cm (2 in.) on the cab floor, and there was no provision to drain the water.

13.5 Technical Assessment

The M978 was capable of operating in water 121.9 cm (48 in.) deep. Engine, hydraulic system, power train, and brake performance complied with the requirements. The criterion in paragraph 13.2 was met.

Inadequacy of the door seals to prevent leakage coupled with the lack of drain provisions was considered a shortcoming.

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14. ENVIRONMENTAL OPERATIONS

14.1 Objectives

The objectives were:

a. To determine the M978 engine starting ability at -32 °C (-25 °F) without the aid of an arctic kit.

b. To determine the M978 engine starting ability at -46 °C (-50 °F) with the aid of an arctic kit.

c. To determine the M978 crew heater and windshield defroster performance at -32 °C and -46 °C using the standard vehicle heater.

d. To determine the functioning capability of the M978 fuel pumping system at -32 °C and -46 °C.

14.2 Criteria

a. Kits. Each vehicle shall operate in accordance with the specification requirement and the manufacturer's technical data after installation of and during the use of the kits specified herein. When specified (see paragraph 6.2) the manufacturer shall be required to furnish and install the following kits (MIL-T-PD-977, para 3.1.1.4).

b. Arctic kit, engine. This kit shall permit the vehicle to start within 45 minutes and operate within 15 minutes of starting, in a safe manner and without causing damage to the vehicle after 24 hours of cold soak under extreme climatic conditions specified in paragraph 3.1.1.5.1. Kit components and parts shall have been proven in previous commercial service or military service for extreme cold operation. Each arctic kit equipped vehicle shall have the necessary fittings, ducts, etc., to make it compatible with the vehicle. The use of external energy for component warming is prohibited. The proper application and use of the kit shall in no way affect the life expectancy of the vehicle or its components (MIL-T-PD-977, para 3.1.1.4.1).

c. Climatic conditions. The vehicle shall be capable of starting and operating within 30 minutes in ambient temperatures from -25 degrees F to +120 degrees F and from -500 feet through +1200 foot altitude using only those onboard aids described in paragraph 3.4.1.6 (MIL-T-PD-977, para 3.1.1.5).

d. Climatic design type (cold). The vehicle shall be capable of starting within 45 minutes and operating in a safe manner and without causing damage to the vehicle within 15 minutes after starting in ambient temperatures of -25 °F to -50 °F with arctic kit (see para 3.1.1.4.1) installed. Kit components and parts shall have been in previous commercial or military service (MIL-T-PD-977, para 3.1.1.5.1).

Note: Underlined portions were not addressed.

e. Engine starting. An ether injection system and/or a fixed preheating system shall be provided. If an ether system is to be used, the following design characteristics shall be implemented per MIL-E-52649 (MIL-T-PD-977, para 3.4.1.6):

(1) The system shall be a permanent allowing ether to be injected directly through a closed system to the engine intake.

(2) Release of the ether shall be done remotely.

(3) A metering system shall limit the amount of ether to the engine.

(4) A thermal switch shall be incorporated to prevent ether injection when the engine is operating or sufficiently warm for unassisted starting.

f. Cab heater and defroster. Manufacturer's standard operational fresh air heater and defroster with controls capable of providing adequate heat and window visibility in the temperatures to -25 degrees F at 55 mph road speeds and 15 mph wind speed, and in compliance with FMVSS 103 and SAE J382 (MIL-T-PD-977, para 3.4.14).

Note: Underlined portions was not addressed.

14.3 Test Procedure

Prior to initiating the environmental chamber test, the vehicle was winterized by putting arctic antifreeze in the cooling system and lubricating oil, OEA (MIL-L-46167), in the engine and transmission. The fuel used for this test was fuel oil, arctic grade DF-A, Federal Specification VV-F-800A.

Thermocouples were installed at the following locations:

a. Chamber ambient.

b. Engine oil sump.

c. Transmission oil sump.

d. Fuel to engine.

e. Battery electrolyte.

f. Personnel heater outlet - left.

g. Personnel heater outlet - right.

h. Defroster outlet - left.

i. Defroster outlet - right.

14.3 (Cont'd)

j. Air at driver's head.

k. Air at driver's feet.

l. Air at passenger's head.

m. Air at passenger's feet.

n. Air at center of cab.

o. Air in battery box.

p. Fuel in bulk tank.

All temperatures and voltages (battery, shunt, etc.) were recorded using a Fluke datalogger.

All starting attempts were made with fresh, fully-charged, cold-soaked batteries.

After each start the engine was permitted to run for 15 minutes prior to operating the pumping system. The fuel pumping system was then unstowed, exercised, and restowed.

Personnel heater and windshield defroster tests were conducted at -32 °C. All temperatures during the personnel heater and defroster tests were monitored at 10-minute intervals. Test conditions for the personnel heater test were:

a. Heater control on "HI" heat position.

b. All heater outlets open.

c. Vehicle exits closed.

d. No personnel in vehicle.

e. Engine running at high idle (1500 rpm).

Test conditions for the windshield defroster test were:

a. Heater control on "HI" heat position.

b. Windshield coated with approximately 0.8 mm (1/32 in.) of ice.

c. All defroster outlets open.

d. Vehicle exits closed.

e. No personnel in vehicle.

f. Engine running at high idle (1500 rpm).

An oil leak occurred during the engine start test at -46 °C which necessitated termination of the test. Personnel heater and windshield defroster tests were, therefore, conducted only at -32 °C.

14.4 Test Findings

Data recorded during the environmental chamber tests are included in Enclosure 5.

At -32 °C, the engine was successfully started two consecutive times on vehicle batteries without the aid of the arctic kit heater.

At -32 °C, cab heating was satisfactory. The standard heater raised the temperature in the center of the cab from -32 °C to 16 °C (60 °F) within 40 minutes.

At -32 °C, windshield defrosting was satisfactory. The defroster was capable of clearing approximately 80% of the windshield within 60 minutes.

At -32 °C, the following discrepancies were noted on the ancillary pumping system:

a. The hand-actuated valve control air hose ruptured which rendered the pumping system inoperative.

b. The D1 nozzle could not be installed on the bulk load receptacle without first warming it up.

c. The V5 air actuated butterfly valve would not open when the hand control was actuated which rendered fuel unloading impossible.

Prior to testing at -46 °C, the V5 valve was removed to determine why it would not activate at -32 °C. It was discovered that the disk in the valve was not adjusted over the center of the valve seat. At low temperatures, the rubber valve seat hardened thus preventing the disk from rotating over the crown of the valve seat. The disk was then adjusted to the center by turning the two adjusting screws on the pneumatic actuator. Photographs of this valve taken before and after the adjustment are in Enclosure 5. Testing was continued at -46 °C.

At -46 °C, the engine failed to start on vehicle batteries after preheating the engine 45 minutes with the arctic kit heater.

The following discrepancies were noted at -46 °C on the ancillary pumping system and engine:

a. The bulk delivery hoses were so stiff they could not be bent for installation.

b. After opening, the butterfly valve could not be closed because the hand-actuated (deadman) valve stuck in the open position.

c. Actuation of the ether injection switch was impossible by hand due to freezing of the rubber boot covering the switch.

d. The bulk fuel delivery hose was too stiff to be of any use during fueling operations.

e. The engine oil pressure gauge failed to register.

f. The engine shut-off switch failed to function.

g. The oil-water indicator warning light remained illuminated for approximately 4 minutes after the engine was started.

h. The transmission oil filter leaked when the engine was started.

i. The front main engine seal developed a leak serious enough to require termination of the environmental chamber test.

14.5 Technical Assessment

Engine starting ability, personnel heating, and windshield defrosting were satisfactory at -32 °C (-25 °F). However, numerous problems concerning the fuel pumping system were encountered during the low temperature test that rendered the system nonoperational. Many of the problems encountered during this test were identified and reported during the April 1986 CPT. Results from this test indicate little has been done since 1986 to correct the inadequacies of the fuel dispensing system at low temperatures. The criteria in paragraphs 14.2c and d were not met and a deficiency was assessed. A deficiency was also assessed against the 15-foot delivery hose because it was too stiff at -46 °C (-50 °F) to be of any use during bulk fueling operations. In addition, shortcomings were assessed because the rubber boot on the ether injection switch was too stiff to be compressed by hand at -46 °C (-50 °F), and because the V5 butterfly valve was improperly adjusted during assembly (quality defect).

An engine heater was available and used during testing at -46 °C. Even though the engine failed to start on its own, the heater functioned properly and raised the coolant temperature to +10 °C (+50 °F) prior to the start attempt. The criteria in paragraphs 14.2a and b were met.

An ether injection system was present on the M978 and complied with the requirements of MIL-T-PD-977. The criterion in paragraph 14.2e was met.

Since heating and defrosting were satisfactory at -32 °C (-25 °F), the criterion in paragraph 14.2f was met.

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15. ELECTROMAGNETIC INTERFERENCE (EMI)

15.1 Objective

The objective was to determine if the broadband radiated emissions from the tanker and its electrical subsystems were within the allowable limits for subtest UM03 of MIL-STD-461B over the frequency range of 30 to 75.95 MHz.

15.2 Criterion

Electromagnetic emission. The tractor shall meet the requirements of MIL-STD-461 Notice 4. RE05 and CE07 steady state conducted emissions over a frequency range of 30 MHz thru 75.95 MHz; RS03 except for electrical controls which have an alternate manual backup capability, i.e., crane remote controls, 100 volts per meter verticalle polarized and 10 volts per meter horizontally polarized over a frequency range of 200 KHz to 10 MHz, 100 volts per meter for both horizontally and vertically polarized waves over a frequency range of 10 MHz to 100 MHz and 200 volts per meter for both horizontally and vertically polarized waves over a frequency range of 100 MHz to 11 GHz. All other vehicle types shall comply with the requirements for Class C1 equipment and systems as per MIL-STD-461B, UM03 steady state radiated emissions over a frequency range of 30 to 75.95 MHz (MIL-T-PD-977, para 3.4.2.5).

Note: Underlined portion was not addressed.

15.3 Test Procedure

The radiated emission test was performed in the electromagnetic interference (EMI) shielded enclosure using the methods outlined in MIL-STD-462, Notice 3(EL) for subtest UM03 (encl 2, ref 14).

A computer-controlled spectrum surveillance system, model CCS-750, and its ancillary equipment were used to measure and record the radiated emissions from the tanker and its electrical subsystems. The test antennas were placed 1 meter from the vehicle and 1-1/2 meters above the floor. Measurements were taken at the front, rear, and both sides of the vehicle over the frequency range of 30 to 75.95 MHz. Measurements were made with the biconical antenna polarized in both the vertical and horizontal planes. Radiated emission measurements were made with each of the following subsystems operating:

a. Engine and battery charging system operating at slow idle.

b. Engine and battery charging system operating at fast idle.

c. Four-way flashers.

d. Left side directional signal.

e. Right side directional signal.

f. Low-air warning buzzer (ignition switch on and engine stopped).

g. Personnel heater on high.

h. PTO fuel pump with engine at high idle.

i. Horn button depressed momentarily every 2 to 3 seconds.

j. Auxiliary fuel pump (engine stopped).

A list of instrumentation used to perform the radiated emission test is given in Table 15-1.

TABLE 15-1. RADIATED EMISSION TEST INSTRUMENTATION

Nomenclature	Model/Serial No.	Frequency Range
System, spectrum surveillance[a]	CCS-750/12577	14 Hz to 18 GHz
Antenna, 41-inch whip	RVR25/232	14 KHz to 30 MHz
Antenna, biconical	BIA25/232	20 to 200 MHz

[a]Calibration date: December 1987.
Calibration due date: June 1988.
Accuracy: Frequency ± 2%.
Amplitude ± 2 dB.

15.4 Test Findings

Results of the radiated emissions tests are graphically presented in Enclosure 5 and summarized in Table 15-2.

TABLE 15-2. RADIATED EMISSION TEST RESULTS[a]

Subsystem	Pass	Fail	Max dB Above Limit
Engine charging system, slow idle	X		
Engine charging system, fast idle	X		
Four-way flashers	X		
Left side directional signal	X		
Right side directional signal	X		
Low-air warning buzzer		X	13
Personnel heater	X		
PTO fuel pump	X		
Horn (transient)		X	32
Auxiliary fuel pump	X		

[a]For each subsystem, the results were the same with the biconical antenna polarized in both the horizontal and vertical planes.

15.5 Technical Assessment

Radiated emissions from the low-air warning buzzer and horn failed to meet the limits of subtest UM03 over the frequency range of 30 to 75.95 MHz. The criterion in paragraph 15.2 was not met and a shortcoming was assessed.

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16. HUMAN FACTORS ENGINEERING (HFE)

16.1 Objectives

The objectives were:

a. To determine if the M978 HEMTT tanker meets the interior steady-state noise level criteria of MIL-STD-1474B (MI) (encl 2, ref 10).

b. To determine the 85 dB(A) noise level contour of the M978 HEMTT tanker.

c. To perform functional/safety checks of handholds, ladders, steps, cab, mirrors, and exhaust.

16.2 Criteria

a. Human factors. The vehicle design shall include established human factors engineering design practices per MIL-STD-1474, MIL-STD-1472, MIL-HDBK-759, and appropriate SAE standards and recommended practices. Specific requirements are (MIL-T-PD-977, para 3.2.2):

(1) The vehicle shall be operable and maintainable by the full range of Army personnel (5th percentile female through 95th percentile male), wearing the full range of Army clothing. All hand holds and steps necessary for the operator and maintenance personnel to gain access to the various locations on the vehicle shall be an integral and permanent part of this vehicle, with the exception of the moveable ladder to provide access to both sides of the windshield for cleaning and to the top of the vehicle work area from both sides. The ladder to be stored in a readily accessible location.

(2) Crew environmental factors (heating, ventilation, toxic fumes, lighting, noise, vibration, and shock) shall not degrade mission performance or cause health hazards.

b. Air/sound pollution (MIL-T-PD-977, para 3.2.3).

(1) Vehicles shall comply with the Environmental Protection Agency regulations governing control of air pollution from new motor vehicles and new motor vehicle engines, in effect on the date of contract award.

(2) The interior sound level shall conform to Federal Motor Carrier Safety Regulation 393.94. The vehicle exterior sound level shall conform to the Interstate Motor Carrier Noise Emission Standards of the Environmental Protection Agency when tested in accordance with the regulations of the Department of Transportation, part 325.

Note: Underlined portions were not addressed.

(3) Vehicles shall also comply with both the exterior and interior noise limits outlined in MIL-STD-1474. The exterior sound level limits shall not be exceeded when measured according to the test procedures cited in SAE J366. The steady state interior noise levels in personnel occupied areas shall not be exceeded when measured by MIL-STD-1474 with a steady state noise category of D. The personnel occupied areas shall be the following: each operator and crew position and occasionally occupied positions.

c. Noise Controls. The maximum noise level during any mode of refueling shall not exceed 85 DBA at 25 meters from the vehicle (MIL-T-PD-977, para 3.5.2.4.10).

16.3 Test Procedure

This procedure was taken in general from TOPs 1-2-608, 1-2-610, and 1-1-012 (ref 35, 33, and 18). Test instrumentation is listed in Enclosure 5.

16.3.1 Steady-State Noise (Interior)

Steady-state noise levels were measured in accordance with TOP 1-2-608 with the vehicle operating on asphalt paved Perryman Test Area. Microphones were positioned 15 cm to the right of the driver's and passenger's head positions with the sensing elements oriented vertically and parallel to the ground surface. The vehicle was tested at speeds from 8 to 88 km/hr (5 to 55 mph) in 8 km/hr (5 mph) increments under the following test conditions:

a. Windows closed, fan on high.

b. Windows closed, fan off.

c. Windows open, fan off.

Steady-state noise data were recorded on magnetic tape and subsequently processed in the laboratory to provide an octave band analysis.

16.3.2 Steady-State Noise (Exterior)

16.3.2.1 Operator's fueling station. Noise levels at the operator's fueling station (rear of vehicle) were measured during fuel circulation exercises with a microphone placed vertically 1.5 meters above the ground with the sensing element parallel to the ground surface.

16.3.2.2 Noise contour (85 dB(A)). A microphone attached to a portable sound level meter was positioned vertically 1.5 meters above the ground with the sensing element parallel to the ground surface. The sound level meter was held adjacent to the vehicle and moved away until a reading of 85 dB(A) was obtained. Measurements were taken 360^{o} around the vehicle in 30^{o} increments.

16.3.3 Equipment Safety/Functionality

Design checklists derived from TOP 1-2-610 were used to assess the functionality and safety of handholds, ladders, steps, cab, mirrors and exhaust.

16.4 Test Findings

16.4.1 Steady-State Noise (Interior)

Steady-state noise data are presented in Enclosure 5. Microphone accuracy is ± 2 decibels (dB).

16.4.2 Steady-State Noise (Exterior)

16.4.2.1 Operator's fueling station. Noise levels around the operator's fueling station are presented in Table 16-1.

TABLE 16-1. NOISE LEVELS AT FUELING STATION[a]

Octave Band Center Freq, Hz	Noise Level, dB
31.5	64
63	77
125	87
250	79
500	86
1000	84
2000	78
4000	76
8000	71

[a]The A-weighted noise level was 88 dB(A).

16.4.2.2 Noise contour (85 dB(A)). Noise contour data are presented in Table 16-2 and are graphically depicted in Enclosure 5.

TABLE 16-2. 85 dB(A) NOISE CONTOUR

Clockwise Position Around Vehicle, deg	Radial Distance From Center of Vehicle, meters
0 (front of veh	7.5
30	8.0
60	7.3
90	5.6
120	5.8
150	3.9
180	6.1
210	3.9
240	5.6
270	7.6
300	7.1
330	8.4

veh = Vehicle.

16.4.3 Equipment Safety/Functionality

HFE/safety problems associated with the ladders, handholds, steps, cab, mirrors, and exhaust are as follow:

a. Both the permanent ladder (rear of vehicle) and the moveable ladder lack nonskid surfaces.

b. Sharp edges exist at the top of the moveable ladder.

c. Adequate handholds are not provided for climbing the ladder on the rear of the vehicle to access the top fueling port.

d. The travel restraints for the moveable ladder are difficult to use.

e. The spacing of 28.9 cm (11.4 in.) between the stringers of the rear ladder does not meet the minimum spacing requirements of MIL-STD-1472C.

16.5 Technical Assessment

16.5.1 Steady-State Noise (Interior)

The steady-state noise limit of 85 dB(A) (MIL-STD-1474B(MI), Table 2, Category D) was exceeded at the driver's and passenger's positions at a speed of 88 km/hr (55 mph) with the windows closed and the fan off. The steady-state noise limit was also exceeded at the driver's and passenger's positions at speeds of 80 km/hr (50 mph) or greater with the windows open and the fan off. Single hearing protection (ear plugs or muffs) were required to be worn by the driver and passenger of the M978 HEMTT tanker when operating at speeds of 80 hr (50 mph) or greater. Since the limits of Category D were exceeded, the criterion in paragraph 16.2b was not met and a shortcoming was assessed.

16.5.2 Steady-State Noise (Exterior)

16.5.2.1 Operator's fueling station. The maximum steady-state noise limit of 85 dB(A) (MIL-STD-1474B(MI)) was exceeded at the operator's fueling station while fueling was in process (high engine idle required to perform fueling operations). Single hearing protection (ear plugs or muffs) was required to be worn by the operator during fueling operations.

16.5.2.2 Noise contour (85 dB(A)). The steady-state noise limit of 85 dB(A) (MIL-STD-1474B(MI)) was exceeded while the fueling station was operating (high engine idle was required to operate the fueling station). Single hearing protection (ear plugs or muffs) was required to be worn by personnel when working within 8.5 meters of the vehicle during fueling operations. Since the noise level 25 meters from the vehicle was less than 85 dB(A), the criterion in paragraph 16.2c was met.

16.5.3 Equipment Safety/Functionality

The following shortcomings were assessed according to hazard severity and probability in accordance with MIL-STD-882 (ref 12) and TOP 1-1-012 (ref 18).

a. Both the permanent and the moveable ladder lacked nonskid surfaces (Class IIIC safety hazard).

b. Sharp edges exist on the top of the moveable ladder (Class IIIC safety hazard).

c. Adequate handholds were not provided for climbing the ladder at the rear of the vehicle to access the top fueling port (Class IIIC safety hazard).

d. The travel restraints for the moveable ladder were difficult to use (Class IVA safety hazard).

The spacing between the stringers on the rear ladder was 11 mm too close. This is considered minor and is provided for information. Based on the shortcomings assessed, the criterion in paragraph 16.2a was not met.

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17. SAFETY TEST

17.1 Objective

The objectives were:

a. To ensure that safety and health hazards associated with the operation and maintenance of the M978 were eliminated or otherwise minimized.

b. To ensure that safety and warning devices were adequate to provide the protection for which they were intended.

17.2 Criteria

a. Safety. Vehicles and furnished accessories shall comply with all Federal Motor Vehicle Safety Standards and Carrier Safety Regulations, in effect on the date of contract award, as stated in MIL-STD-1180, Safety Standards for Military Ground Vehicles. The safety characteristics of the vehicles shall also meet the following requirements (MIL-T-PD-977, para 3.2.1).

(1) For exposed components and systems which are subject to high temperatures and high pressures, which are electrically actuated or inherently hazardous, the safety characteristics shall provide safeguarding and insulating features.

(2) Step surfaces shall provide a nonskid footing.

(3) Non-functional sharp edges, projection points, and excessive length of fasteners shall be eliminated.

b. System design will embody features to protect personnel from electrical and mechanical hazards and other dangers that might arise from fire, elevated operating temperatures, toxic fumes or dangerous environment. System design will, in general, adhere to essential safety principles and standards (Test Agency devised, TECOM approved).

c. The design shall provide work environments which foster effective procedures, work patterns, and personnel safety and health, and which minimize discomfort, distraction, and any other factors which degrade human performance or increase error. Design shall also be directed toward minimizing personnel and training requirements within the limits of time, cost, and performance trade-off (Test Agency devised, TECOM approved).

Note: Underlined portion was not addreesed.

17.3 Test Procedure

Specific tests to determine vehicle safety and health hazards were not performed separately during the test. However, observations related to potential safety and health hazards were made throughout the test. The following scheduled tests were considered in the overall safety and health assessment:

a. Initial/Final Inspection and Servicing (para 2).

b. Gradeability and Side Slope Performance (para 5).

c. Human Factors Engineering (para 16).

d. Logistic Supportability (para 18).

e. Endurance and Reliability (para 19).

17.4 Test Findings

The following safety hazards were discovered throughout the course of testing and are arranged according to the subtest during which they were reported.

a. Gradeability and Side Slope Performance. On longitudinal grades steeper than 15%, fuel was noted to be leaking from the overpressure relief valve at the top front of the tank with no provisions to route the fuel away from the emgine compartment.

b. Human Factors Engineering.

(1) Both the permanent ladder and the moveable ladder lacked nonskid surfaces.

(2) Sharp edges existed on the top edge of the moveable ladder.

(3) Adequate handholds were not provided for climbing the ladder on the rear of the vehicle to access the top fueling port.

(4) The travel restraints for the moveable ladder were difficult to use.

c. Logistic Supportability.

(1) The vehicle does not have a master electrical switch that stops all electrical power or a manual emergency engine fuel shut off. If the engine does not shut off electrically, the operator must obtain a jack handle from the on vehicle equipment (OVE) box, raise the engine cover and use the jack handle to operate the fuel shut off.

(2) To obtain work platform access on the right side of the engine the spare tire must be removed. The frame and the tire mounting stud for the spare tire mount still interferes with maintenance operations.

(3) The cooling fan shroud does not encircle the fan blades and leaves too large an area exposed which can effect personnel safety.

(4) The location and design of the vehicle battery box requires a person to stand on something and lean across the front batteries to service the rear batteries.

(5) There is insufficient room on the fender to stand and operate the hand operated spare tire winch.

17.5 Technical Assessment

Fuel leaking from the overpressure relief valve into the area of the engine compartment was classified as a deficiency (Class IIC safety hazard).

The following component design inadequacies were classified as shortcomings:

a. Lack of nonskid surfaces on both the permanent and moveable ladders (Class IIIC safety hazard).

b. Sharp edges on the top of the moveable ladder (Class IIIC safety hazard).

c. The lack of adequate handholds for climbing the ladder on the rear of the vehicle (Class IIIC safety hazard).

d. Difficulty in using the travel restraints (Class IVA safety hazard).

e. Lack of an electrical master switch (Class IIIC safety hazard).

f. Lack of a shroud to completely encircle the fan blades (Class IID safety hazard).

g. Limited access to the battery box (Class IIIC safety hazard).

Limited access to the spare tire winch is classified as a suggested improvement (Class IVB safety hazard).

Due to the deficiency and shortcomings assessed, the criteria in paragraphs 17.2a through c were not met.

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18. LOGISTICS SUPPORTABILITY

TECOM Supplement 1 to DARCOM Regulation 700-15 (encl 2, ref 7) was used as a guide in the collection and analysis of vehicle/maintenance data. Data were acquired during the entire test project for each of the logistic supportability subtests and evaluated in the appropriate subelement.

18.1 Maintainability Indices

18.1.1 Objective

The objective was to collect all maintenance data generated as a result of maintenance performed in the support of the test item during test and, based on these data, compute various maintainability indices for comparison to applicable criteria.

18.1.2 Criteria

a. Maintainability. The maintenance ratio (MR) for the basic chassis shall not exceed 0.23 at an average vehicle speed of 15.2 miles per hour (mph). This shall be demonstrated on a basic chassis operating for a total test time of 20,000 miles plus a composite engine idle time necessary to operate the various ancillary equipment. If, during test, the average mph is other than the specified, the MR operating hours will be normalized to coincide with the specified mission profile. Any scheduled and/or unscheduled maintenance performed on the ancillary equipment during the endurance test will not be included in the basic chassis MR. All type vehicles of this family shall be designed so that the following can be removed from the vehicle and replaced in under four hours by a 4-man crew:

(1) Transfer Case.

All type vehicles of this family shall be designed so that each of the following can be removed from the vehicle and replaced in under four and one half hours by a 4-man crew:

(2) Engine (only).

(3) Transmission (only).

(4) Engine - transmission assembly.

The four hour criteria includes all preparation, i.e., hood removal, tilting the cab or draining fluids etc. Routine daily maintenance checks, i.e., engine oil, coolant level, battery liquid level, etc., must be readily accessible without the use of tools. Preoperation fluid level checks shall not take longer than 5 minutes. Components of the chassis shall be accessible for servicing, repair, and replacement. Ease of maintenance provisions shall incorporate features insuring operating clearances and facilitating maintenance and service operations. The vehicle design shall incorporate maintainability design principles per AMC Pamphlet 706-134 (MIL-T-PD-977, para 3.3.8.2).

b. Maintainability. The maintenance ratio (MR) for the Fuel Loading/Dispensing System shall not exceed 0.09. All scheduled and unscheduled maintenance man-hours, excluding operator/crew checks and services, shall be included in this ratio (MIL-T-PD-977, para 3.5.2.7).

18.1.3 Test Procedure

All maintenance operations required during the course of testing were performed in accordance with applicable maintenance manuals. Preventive maintenance tasks were performed at specified intervals; corrective maintenance was limited to that required to keep the system operational. All crew, organizational, and DS/GS level maintenance operations were monitored to accumulate required data; operator's daily checks and services were observed sufficiently to obtain a representative time to perform these tasks. The computer-based Automated Data Collection System (ADACS) was used in the collection and analysis of all maintenance data. Each maintenance task was appropriately coded to enable ready retrieval of data as it pertains to each of the systems/subsystems.

18.1.4 Test Findings

a. The vehicle was received for testing and is identified as NPOF6Y throughout the data. The vehicle was tested for 8048 km (5001 mi) and the ancillary equipment for 50.8 hours.

b. A summary of data and composite values for the vehicle is presented in Tables 18-1 through 18-5. Data has not been officially scored by scoring conferences. The MRs presented are the ratios as demonstrated during testing.

c. The preoperation fluid-level checks did not take longer than 5 minutes to perform.

d. The MR that resulted from testing of the vehicle chassis was 0.046 versus a requirement of not more than 0.23. Average vehicle speed (based on 5001 miles and 200 operating hours) was 25 mph.

e. The MR that resulted from testing of the vehicle ancillary system was 0.187 versus a requirement of not more than 0.09.

f. Vehicle No. NPOF6Y was tested for 6077 km (3777 mi) when the fuel dispensing primary pump developed a Class III leak between the liquid pump housing and the pump casing. The pump leak occurred after 39 hours of pump operation. The primary pump was replaced with a new pump. Inspection of the new primary pump after 0.9 hour of operation revealed a Class III leak between the pump housing and the pump casing which is the same location as the leak on the original pump. The mechanical rotary seal was replaced in the new pump. After 1.1 hours of pump operation, inspection revealed a Class III leak at the same location as previously reported. A new primary pump assembly was installed and operated 9.6 hours to the completion of test. The new pump assembly was a different design with the bottom opening of the intermediate housing larger than the opening on the original pump. There was no longer a leak between the liquid pump housing and the casing after replacement of the pump.

g. Of the 8.78 man-hours spent for unscheduled maintenance to the ancillary system, 8.70 man-hours were expended by twice replacing the fuel dispensing primary pump.

TABLE 18-1. MAINTENANCE SUMMARY - M978 VEHICLE

Characteristics	Data
Item ID No.	NPOF6Y
Total test miles	5001
Total test kilometers	8048
Total operating hours	200.0
Total maintenance tasks	18
Scheduled	6
Operator/crew	0
Organizational	6
Direct support	0
General support	0
Depot	0
Unscheduled	12
Operator/crew	0
Organizational	10
Direct support	2
General support	0
Depot	0
Total active clock hours	18.38
Scheduled	5.25
Operator/crew	0.00
Organizational	5.25
Direct support	0.00
General support	0.00
Depot	0.00
Unscheduled	13.13
Operator/crew	0.00
Organizational	11.12
Direct support	2.02
General support	0.00
Depot	0.00
Total active man-hours	18.68
Scheduled	5.25
Operator/crew	0.00
Organizational	5.25
Direct support	0.00
General support	0.00
Depot	0.00

TABLE 18-1 (CONT'D)

Characteristics	Data
Item ID No.	NPOF6Y
Unscheduled	13.43
Operator/crew	0.00
Organizational	11.42
Direct support	2.02
General support	0.00
Depot	0.00

TABLE 18-2. MAINTENANCE DATA SUMMARY - BASE CHASSIS

Characteristics	Data
Item ID No.	NPOF6Y
Total test miles	5001
Total test kilometers	8048
Total operating hours	200.0
Total maintenance tasks	12
Scheduled	3
Operator/crew	0
Organizational	3
Direct support	0
General support	0
Depot	0
Unscheduled	9
Operator/crew	0
Organizational	7
Direct support	2
General support	0
Depot	0
Total active clock hours	8.98
Scheduled	4.53
Operator/crew	0.00
Organizational	4.53
Direct support	0.00
General support	0.00
Depot	0.00
Unscheduled	4.45
Operator/crew	0.00
Organizational	2.43
Direct support	2.02
General support	0.00
Depot	0.00

TABLE 18-2 (CONT'D)

Characteristics	Data
Item ID No.	NPOF6Y
Total active man-hours	9.18
Scheduled	4.53
Operator/crew	0.00
Organizational	4.53
Direct support	0.00
General support	0.00
Depot	0.00
Unscheduled	4.65
Operator/crew	0.00
Organizational	2.63
Direct support	2.02
General support	0.00
Depot	0.00

TABLE 18-3. MAINTENANCE DATA SUMMARY - ANCILLARY

Characteristics	Data
Item ID No.	NPOF6Y
Total test miles	5001
Total test kilometers	8048
Total operating hours	50.8
Total maintenance tasks	6
Scheduled	3
Operator/crew	0
Organizational	3
Direct support	0
General support	0
Depot	0
Unscheduled	3
Operator/crew	0
Organizational	3
Direct support	2
General support	0
Depot	0
Total active clock hours	9.40

TABLE 18-3 (CONT'D)

Characteristics	Data
Item ID No.	NPOF6Y
Scheduled	0.72
Operator/crew	0.00
Organizational	0.72
Direct support	0.00
General support	0.00
Depot	0.00
Unscheduled	8.68
Operator/crew	0.00
Organizational	8.68
Direct support	0.00
General support	0.00
Depot	0.00
Total active man-hours	9.50
Scheduled	0.72
Operator/crew	0.00
Organizational	0.72
Direct support	0.00
General support	0.00
Depot	0.00
Unscheduled	8.78
Operator/crew	0.00
Organizational	8.78
Direct support	0.00
General support	0.00
Depot	0.00

TABLE 18-4. MAINTENANCE INDICES - CHASSIS

Characteristics	Data
Item ID No.	NPOF6Y
Mean time to repair point estimate	0.49
Operator/crew	0.00
Organizational	0.35
Direct support	1.01
General support	0.00
Depot	0.00

TABLE 18-4 (CONT'D)

Characteristics	Data
Item ID No.	NPOF6Y
Achieved availability point estimate	0.96
Maintenance ratio	0.046
Operator/crew	0.000
Organizational	0.036
Direct support	0.010
General support	0.000
Depot	0.000

TABLE 18-5. MAINTENANCE INDICES - ANCILLARY

Characteristics	Data
Item ID No.	NPOF6Y
Mean time to repair point estimate	2.89
Operator/crew	0.00
Organizational	2.89
Direct support	0.00
General support	0.00
Depot	0.00
Achieved availability point estimate	0.84
Maintenance ratio	0.187
Operator/crew	0.000
Organizational	0.187
Direct support	0.000
General support	0.000
Depot	0.000

18.1.5 Technical Assessment

a. Since the collective MR for the base chassis, based on 200 operating hours and 9.18 man-hours of maintenance, was 0.046, the criterion in paragraph 18.1.2a was considered met.

b. Since the ancillary system maintenance ratio (MR) was 0.187 versus a requirement of not more than 0.090, the criterion in paragraph 18.1.2b was not met, and a shortcoming was assessed. The primary factor causing this high MR was the pump failures.

c. Of the three primary fuel dispensing pumps that have been installed on the vehicle, the original pump received and the first replacement pump both had failures of the seal between the liquid pump housing and the pump casing. The second pump replacement (third on vehicle) completed the remainder of the test. It should be noted that this third pump, although having the same part number, was a different design than the previous two pumps with a larger bottom opening on the intermediate housing.

18.2 Supply Support

18.2.1 Objective

The objective was to determine the technical adequacy of repair parts used.

18.2.2 Criterion

Repair parts will be authorized in adequate quantities and diversity at the appropriate maintenance levels, consistent with the Maintenance Allocation Chart, Repair Parts Special Tool Lists (RPSTL) and skills required to install and aline the parts. Repair parts which are used to maintain the system must be interchangeable with like parts being replaced (Test Agency devised, TECOM approved).

18.2.3 Test Procedure

Throughout the conduct of the test, all maintenance operations were observed and any difficulties in installation, alignment, and interchangeability of repair parts were noted. Parts peculiar to the test item were examined to determine if they can be replaced with standard items already in the logistics system. Repair parts were examined with respect to the maintenance category authorized to stock and/or requisition the part and the maintenance category prescribed to replace the part. They were examined to ensure modular design has been considered and they were compared with the repair parts manual to ensure the manual is adequate.

18.2.4 Test Findings

a. The maintenance category authorized to stock and/or requisition the part and the maintenance prescribed to replace the part were compared with the available publications. The comparison data are listed in the Supportability Analysis Chart at Enclosure 6.

b. The repair parts used to maintain the system were interchangeable with the like parts being replaced.

c. One of the primary fuel dispensing pumps that was received as a replacement part failed after 0.9 hour of operation and was considered non operational as received. The failure mode demonstrated by this repair part was the same as on the original pump. The third pump received, although interchangeable and with the same part number, was a different design and did complete the remainder of the test without failure.

18.2.5 Technical Assessment

a. The repair parts were authorized at the appropriate maintenance levels, consistent with the RPSTL and skills required to install and align the parts. The level of maintenance for replacement of the fuel displacement primary pump was not consistent throughout the publications. The Maintenance Allocation Chart called for Direct Support level replacement where the maintenance TM 9-2320-279-20-3 and the Source, Maintenance, and Recoverability (SMR) code in the Repair Parts and Special Tools List (RPSTL) (TM 9-2320-279-20P and TM 9-2320-279-34P) call for organizational level of maintenance.

b. Even though the primary fuel dispensing pump received for replacement was a different design but interchangeable, the criterion in paragraph 18.2.2 was considered met.

18.3 Technical Data/Equipment Publications

18.3.1 Objective

The objective was to determine if the publication completely reflects the system they support and are easily and completely understood by maintenance personnel to whom they were addressed.

18.3.2 Criterion

The equipment publications contained in the system support package (SSP) will be complete, accurate, easy-to-read, consistent in nomenclature, simple to follow, and adequate to permit completion of both scheduled and unscheduled maintenance operations and parts acquisition at all levels of maintenance. Army equipment publications will conform in content and format to that specified in MIL-M-38784B and MIL-M-63000(TM) series of military specifications as applicable (Test Agency devised, TECOM approved).

18.3.3 Test Procedure

During all preventive and corrective maintenance tasks performed, the appropriate manuals provided for support of the test items were reviewed for accuracy, adequacy, simplicity, clarity, and completeness. Each manual, operator through direct and general support was compared with the test item and with MIL-M-38784B (encl 2, ref 16) which prescribes format, content and standards of production for Technical Manuals.

18.3.4 Test Findings

a. The appropriate technical manuals were locally procured. A list of the publications received is included in the Technical Data/Equipment Publications Charts (encl 6).

b. The manuals were adequate to maintain the vehicle and to permit completion of both scheduled and unscheduled maintenance.

c. A few minor discrepancies in the technical manuals remain:

(1) The radiator removal procedure in the organizational manual does not include the preliminary procedure to remove engine cover, which is necessary to remove the radiator.

(2) The Direct Support and General Support Maintenance RPSTL does not illustrate the grease fitting in the tow pintle fluid passage bolt. Also, there are three drivers instrument control panel lights illustrated in the RPSTL that are not identified.

(3) The maintenance level assigned in the Maintenance Allocation Chart (MAC) is not consistent with the maintenance level in the Technical Manual (TM) for replacing the fuel dispensing primary pump since the MAC specifies direct support level and the technical manuals specify organizational level of maintenance.

18.3.5 Technical Assessment

Even though some minor discrepancies exist, the manuals have progressed to a point that they can be adequately used to maintain the system.

The criterion in paragraph 18.3.2 was considered met.

18.4 Support and Test Equipment

18.4.1 Objective

The objective was to determine the adequacy of support and test equipment listed in the SSP, but available at the test site which are planned for use in support of the item when fielded.

18.4.2 Criteria

a. The support and test equipment outlined in the maintenance literature and/or contained in the system support package will be necessary and adequate for the performance of all required maintenance tasks at all levels of maintenance when used in conjunction with the authorized common tools and test equipment contained in the applicable tool kits. Whenever possible, the design of a system should accommodate the use of common tools rather than special tools. Complicated test equipment requiring frequent calibration and restrictive environmental control conditions should be avoided (Test Agency devised, TECOM approved).

b. Other equipment. Each vehicle will be furnished with the tools required by operator or crew for performance of operator/crew level maintenance procedures (Test Agency devised, TECOM approved).

18.4.3 Test Procedure

During all maintenance operations the tools and test equipment authorized in the maintenance support literature were utilized in accordance with instructions contained in applicable equipment publications. Note was made as to whether or not the tools and test equipment were actually needed for their intended tasks and if they could be replaced with common items. Note was also made of any additional tools or test equipment required and of any inadequacies in the equipment publications relative to the use of the tools and test equipment. The assessment was limited to those maintenance tasks actually performed.

18.4.4 Test Findings

a. Assessment of the Simplified Test Equipment for Internal Combustion Engines (STE/ICE) was not performed during testing since there was no troubleshooting incident during testing that required the use of the test set.

b. The vehicle was equipped with the basic issue items necessary for crew authorized maintenance.

c. Normally available common tools were used to maintain the vehicle during testing.

18.4.5 Technical Assessment

a. The system is designed for the maximum use of common tools.

b. Support of the M978 does not require complicated test equipment that requires frequent calibration, or restrictive environmental control.

c. The tools provided for the crew authorized maintenance were adequate and necessary to maintain the vehicle.

d. The criterion in paragraph 18.4.2a was met.

e. The criterion in paragraph 18.4.2b was met since the basic issue items included the tools required to perform crew maintenance.

18.5 Design for Maintainability

18.5.1 Objective

The objective was to determine if the test item meets the maintainability design requirements and adheres to good maintainability design principles.

18.5.2 Criteria

a. Maintainability. Components of the chassis shall be accessible for servicing, repair and replacement. Ease of maintenance provisions shall incorporate features insuring operating clearances and facilitate maintenance and service operations. The vehicle design shall incorporate maintainability design principles per AMC Pamphlet 706-134 (Test Agency devised, TECOM approved).

b. Engine air induction system. The engine air induction system shall be furnished complete and installed from the air inlet silencer to the engine assembly intake opening. It shall have the following general characteristics: The induction air ducts shall not require disassembly for normal vehicle maintenance or element servicing (Test Agency devised, TECOM approved).

18.5.3 Test Procedure

Maintenance operations were monitored and note made of factors such as ease of access to components, test points, modular construction, built-in go/no-go fault isolation indicators and other features which establish that ease of maintenance either has or has not been included in the design. Note was also made of such factors as reliability of components, ability of protective devices to prevent damage during maintenance, and other factors which indicate that the equipment design either has or has not been directed toward minimizing maintenance. AMC Pamphlet 706-134 (encl 2, ref 36) was used as a guide in determining maintainability-design characteristics. Maintenance checklists, observational data records and error reports were used to acquire the design for maintainability data.

18.5.4 Test Findings

a. The front and rear wheel lug nuts are not interchangeable. The lug nuts are not interchangeable from left to right, therefore, four different sizes of lug nuts will be required to be stocked in the supply system.

b. The propeller shafts are designed so that the universal joints must be disassembled to remove the shafts. This exposes the needle bearings and end caps to dirt and requires lengthy maintenance for proper installation.

c. The engine oil filter access requires working in an awkward position which makes holding the weight of the filter assembly undesirable resulting in increased maintenance time and requiring excessive physical strength.

d. The hydraulic filter which is mounted on the inboard exterior of the hydraulic tank has very limited access. There is insufficient room on the left fender to stand and reach the filter. Two options are to lay across the hydraulic tank or the muffler to reach the filter. Another way to reach the filter is to stand on the transmission but this possibly could cause damage to wires and sending units at the power take off pump.

18.5.5 Technical Assessment

a. It is recommended that the propeller shafts be equipped with companion flanges which would enhance the ease of maintenance and prevent the exposure of the needle bearings to dirt during shaft replacement.

b. It is recommended that the locations of the engine oil and hydraulic filters be changed to improve accessibility and ease of maintenance.

c. It is recommended that the vehicle be designed so that the front and rear wheel lug nuts are interchangeable.

d. The criterion in paragraph 18.5.2a was not met and a shortcoming was assessed due to those design inadequacies which are prejudicial to ease of maintenance.

e. Since the air ducts do not require disassembly for normal vehicle maintenance or element servicing on the engine air induction system, the criterion in paragraph 18.5.2b was met.

(Page 92 Blank)

19. ENDURANCE AND RELIABILITY

19.1 Objectives

a. To determine the capability of the test vehicle to travel over prescribed test courses for a prescribed distance and record the nature of incidents, failures, and problems that occurred during operation.

b. To collect all RAM-D data generated during the endurance operation on the trucks and, based on these data, compute various reliability indices for comparison purposes.

19.2 Criteria

a. Reliability. The vehicle, exclusive of material handling system, recovery system, fifth wheel and fuel loading/dispensing system while operating within the environment specified, shall utilize a Best Operational Capability (BOC) of 3000 Mean Miles Between Mission Failure (MMBMF) and shall have a Minimum Acceptable Value (MAV) of 1500 MMBMF. The vehicle shall also utilize a BOC of 1000 Mean Miles Between System Failure (MMBSF) and shall have a MAV of 500 MMBSF (MIL-T-PD-977, para 3.3.8.1).

b. Durability. The vehicle, exclusive of material handling systems, recovery systems, fifth wheel, and fuel loading/dispensing systems shall:

(1) Have not less than a 0.6 probability of completing the first 32,000 kilometers (20,000 miles) of operation without overhaul, rebuild, or replacement of any of the following components:

(a) Engine.
(b) Transmission.
(c) Transfer Case.
(d) Axles.

(2) Have not less than a 0.9 probability of completing the first 32,000 kilometers (20,000 miles) of operation without cracking or significant deformation (will not cause a system failure, mission failure or durability failure) of the frame and major supporting members (MIL-T-PD-977, para 3.3.8.3).

c. The tanker installed system, together with those auxiliary vehicle components which are required for its operation, shall have a BOC of 150 hours MTBF and a MAV of 75 hours MTBF. Since all system components are required for success, the system reliability is equal to mission reliability (MIL-T-PD-977, para 3.5.2.6).

Note: Underlined portions were not addressed.

19.3 Test Procedure

TOP 2-2-506 (encl 2, ref 32) was used as a guide in writing this subtest. One vehicle was operated for 8048 km (5001 mi) on various APG test courses by completing three 2,682 km (1,667 mi) cycles. The tanker was loaded with approximately 9,621 L (2,450 gal.) of stoddard solvent for the entire endurance operation.

In addition, ancillary pumping operations were performed according to the following cycle:

a. Thirty minutes of pumping operation using the No. 1 (left side) hose reel with the D-1 nozzle attached.

b. Thirty minutes of pumping operation using the No. 2 (right side) hose reel with the D-1 nozzle attached.

c. Sixty minutes of bulk unloading using the 3 inch by 15 foot hose connected from the discharge port to the open tank manhole.

The pump was operated on this 2-hour cycle every 200 miles until 50.8 pump operating hours were completed.

19.4 Test Findings

The mileage completed during the endurance test is presented in Table 19-1.

TABLE 19-1. ENDURANCE AND RELIABILITY TEST MILEAGE

Test Course	Distance per Test Cycle km	Distance per Test Cycle mi	Total Distance km	Total Distance mi
Belgian block/ gravel loop	341	212	1023	636
Munson gravel	604	375	1811	1125
Perryman A	1067	663	3201	1989
Perryman 1	32	20	97	60
Perryman 2	66	41	198	123
Perryman 3	35	22	106	66
Churchville B	135	84	405	252
Paved	402	250	1207	750
Total	2682	1667	8048	5001

The vehicle traveled a total of 8,048 km (5,001 mi) and the ancillary pump was operated a total of 50.8 hours.

A summary of system and mission failures is provided in Table 19-2.

19.4 (Cont'd)

TABLE 19-2. HEMTT M978 TANKER FAILURE SUMMARY

TIR No.	Subsystem	Component	Failure Type	Engine Miles	PTO Hours
40	Ancillary	Pressure relief valve	OMF, SF	-	2.1
42	Chassis	Outer wiper, left front No. 1 axle ball socket oil seal	OMF, SF	753	-
43	Chassis	Outer wiper, right front No. 1 axle ball socket oil seal	OMF, SF	1376	-
59	Ancillary	Primary fuel pump	OMF, SF	-	39.0
60	Ancillary	Primary fuel pump	OMF, SF	-	39.9
63	Ancillary	V8 valve coupling	OMF, SF	-	41.2
64	Chassis	Radiator	SF	3899	-

OMF = Operational mission failure.
PTO = Power take-off.
SF = System failure.

a. There were four ancillary failures. According to the failure definition scoring criteria, each ancillary subsystem failure constitutes an operational mission failure. These failures occurred at the pressure relief valve on top of the tanker body, the primary pump assembly between the end support flange and the liquid pump housing, the primary pump assembly between the liquid pump housing and the pump casing, and at the V8 coupling clamp between the pipe tee and the gland packing of the V8 valve. In addition, there were three chassis failures. Two of them involved outer wiper No. 1 axle ball socket oil seal failures and one was a Class III coolant leak from a radiator hose.

b. Fuel was noted to be leaking from the pressure relief valve on top of the bulk tank. This was the only incident of the relief valve leaking reported during the test. No repair was made to the valve and testing was continued.

c. The first pump failure occurred between the liquid pump housing and the pump casing. The pump was replaced at the request of the manufacturer and a new one was installed. The new pump began leaking after pumping 1,921 gallons of solvent and was also found to be leaking between the liquid pump housing and the pump casing. The new pump was disassembled and the rotating mechanical seal and bearing oil seal were replaced. However, replacing these seals did not resolve the problem. Replacement of the second pump with a new one of different design, but identical part numbers, finally resolved the failure (see para 18).

d. The leak at the V8 coupling clamp was repaired by removing and reinstalling the two right pipe clamp couplings. Visual inspection of these clamps revealed no deficiencies.

e. The first outer wiper No. 1 axle ball socket oil seal failure occurred at 753 miles on the left side. The second failure occurred on the right side of the No. 1 axle at 1,376 miles. Both failures were corrected by replacing the outer wiper No. 1 axle ball socket oil seals.

f. The last chassis failure (coolant leaking from a hose Class III) occurred near the end of the test at 3,899 miles. The hose clamp was tightened and the vehicle continued testing.

19.5 Technical Assessment

A summary of calculated results follows:

a. Chassis.

(1) Mean miles between system failure (MMBSF) = 1,667 miles.

(2) Mean miles between mission failure (MMBMF) = 2,500 miles.

(3) The test vehicle MAV requirement of 500 mean miles between system failure (MMBSF) was achieved with 99% confidence. The observed result was 1,667 MMBSF.

(4) Since this CPT consisted of only 5,000 miles of endurance testing, it can be said with only 64% confidence that the vehicle will achieve the required 1,500 mean miles between mission failures. At the end of testing, the vehicle had a demonstrated MMBMF of 2,500 miles.

(5) It was assumed that chassis failures followed an exponential distribution.

(6) The criterion in paragraph 19.2a was met.

b. Ancillary.

(1) Mean time between failure (MTBF) = 12.7 hours.

(2) The ancillary pump and associated equipment was required to meet a mean time between failure of 75 hours. Based on the observed results, it can be said with 37% confidence that the ancillary pump will meet this requirement. The MTBF achieved was only 12.7 hours.

(3) It was assumed that ancillary failures followed an exponential distribution.

(4) The criterion in paragraph 19.2c was not met and a deficiency was assessed.

19.5 (Cont'd)

c. Reliability based on operations.

(1) Figure 19-1 shows a pie graph of operational mission failures divided between ancillary and chassis failures. Ancillary failures made up the majority of the operational mission failures.

(2) Figure 19-2 shows a pie graph of system failures also divided between ancillary and chassis failures. Again ancillary failures made up the majority of system failures.

(3) Figure 19-3 shows a graph of cumulative operational mission failures versus total cumulative hours on the ancillary equipment. The equipment was within specified limits only the first 2.1 hours of operation. For the remainder of the test, the equipment failed to meet the required MTBF.

(4) Figure 19-4 shows a graph of cumulative operational mission failures versus total cumulative miles on the chassis. The chassis suffered two early failures which caused the vehicle to go outside the specified MMBMF. However, no other operational mission failures occurred so that by the end of the test it was well within the MMBMF specification.

(5) Figure 19-5 shows a graph of cumulative system failures versus total cumulative miles on the chassis. The vehicle was always well within the specified MMBSF required for the test.

19.5 (Cont'd)

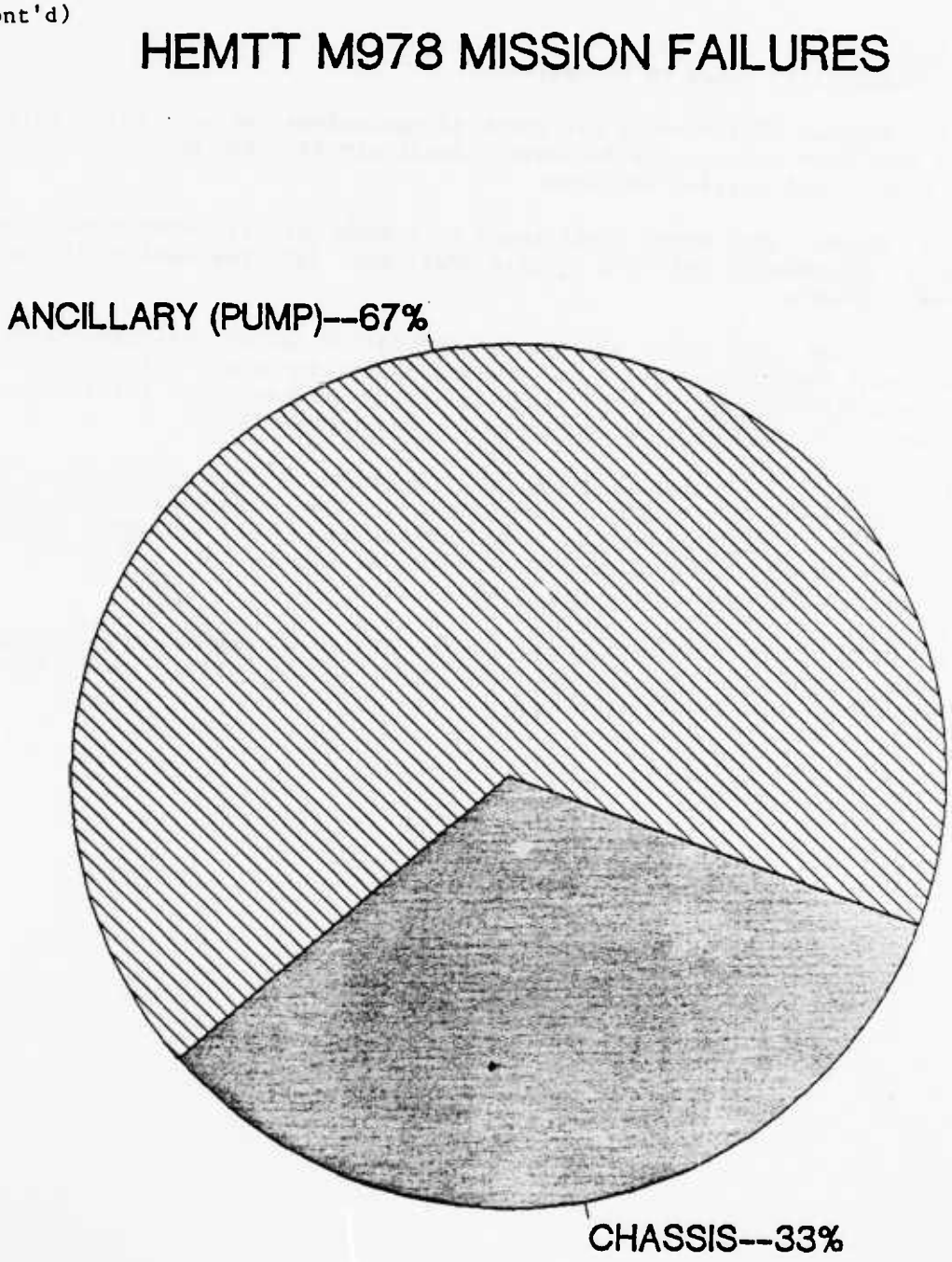

Figure 19-1. Distribution of mission failures.

19.5 (Cont'd)

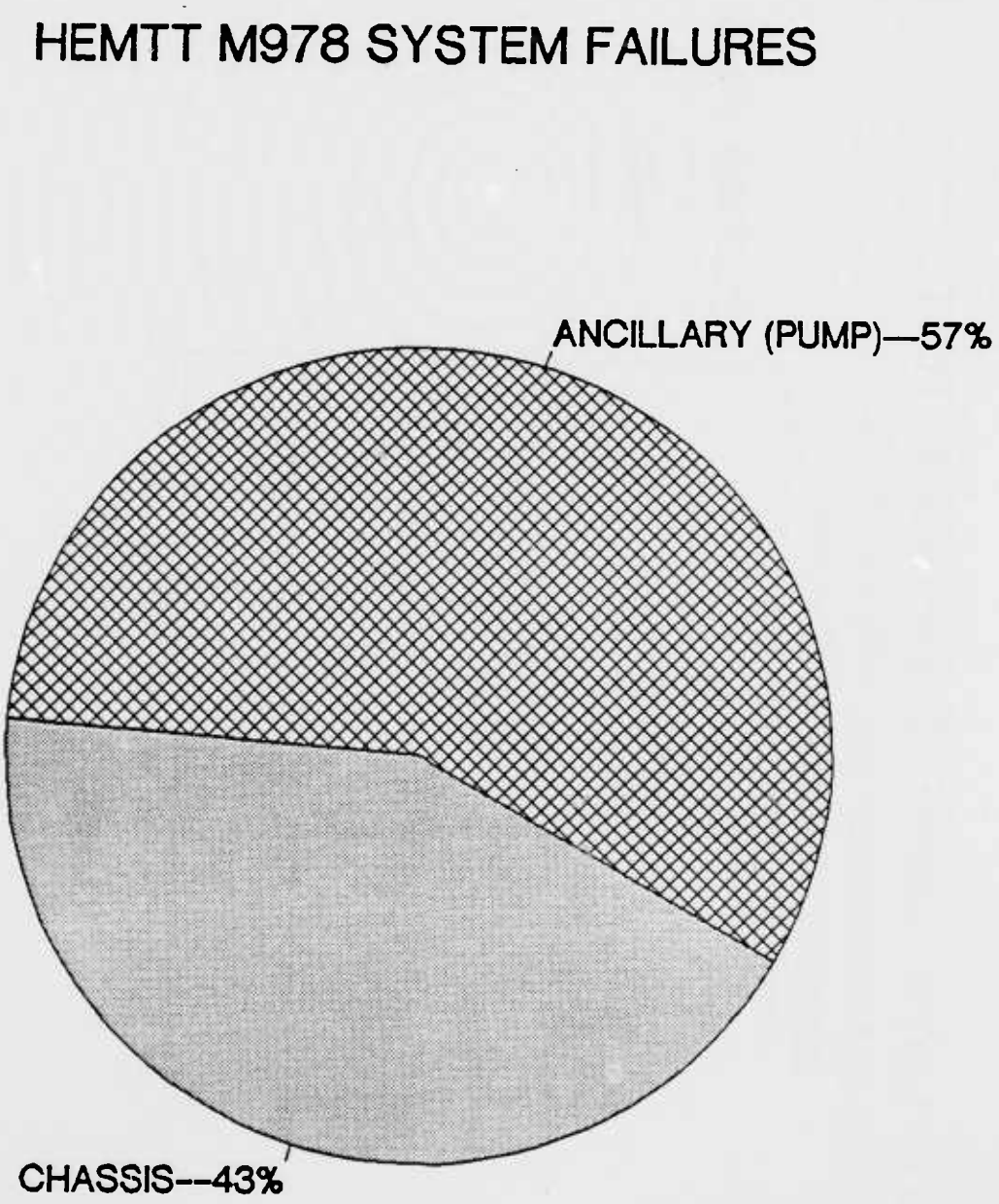

Figure 19-2. Distribution of system failures.

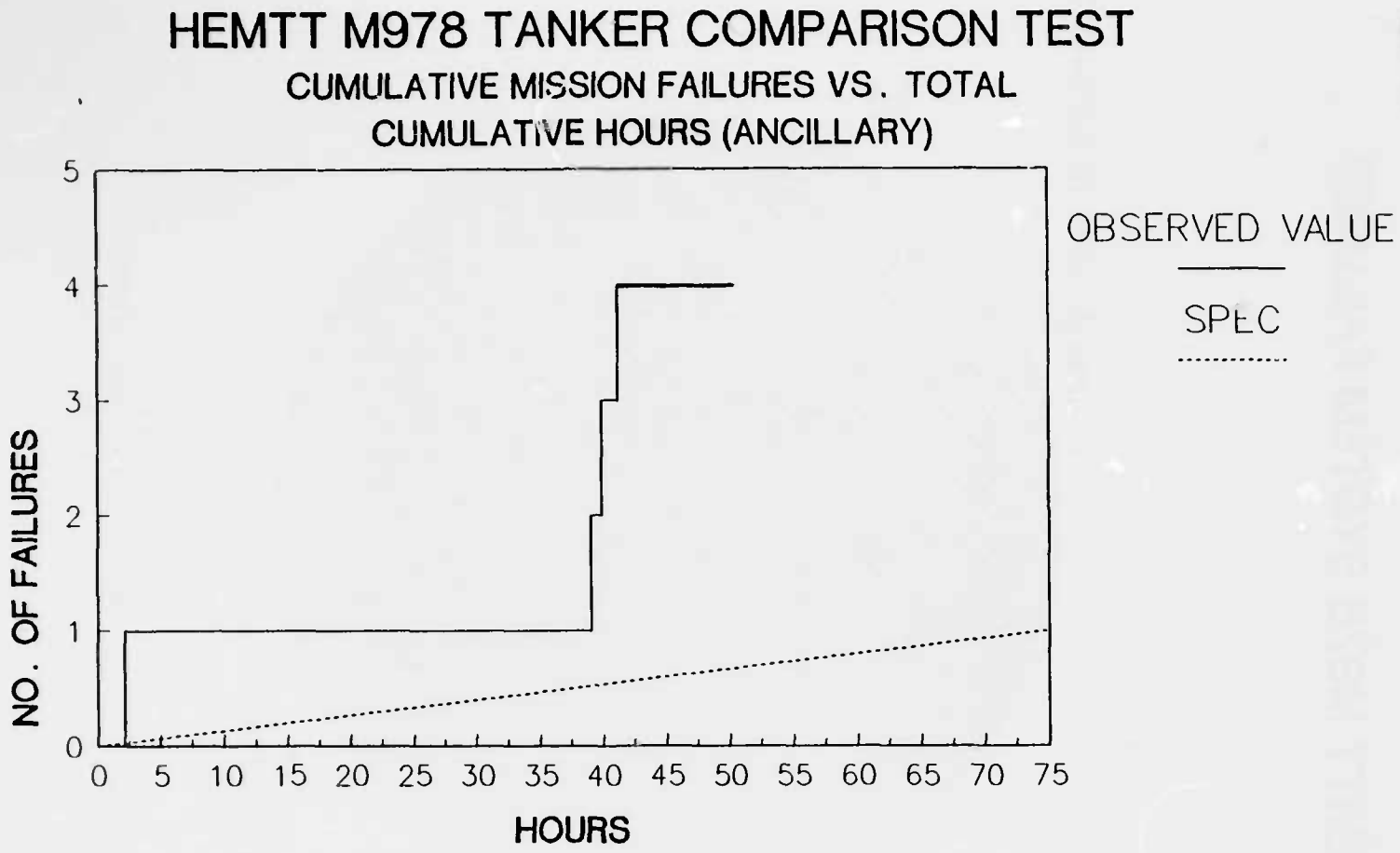

Figure 19-3. Cumulative mission failures versus total cumulative hours (ancillary).

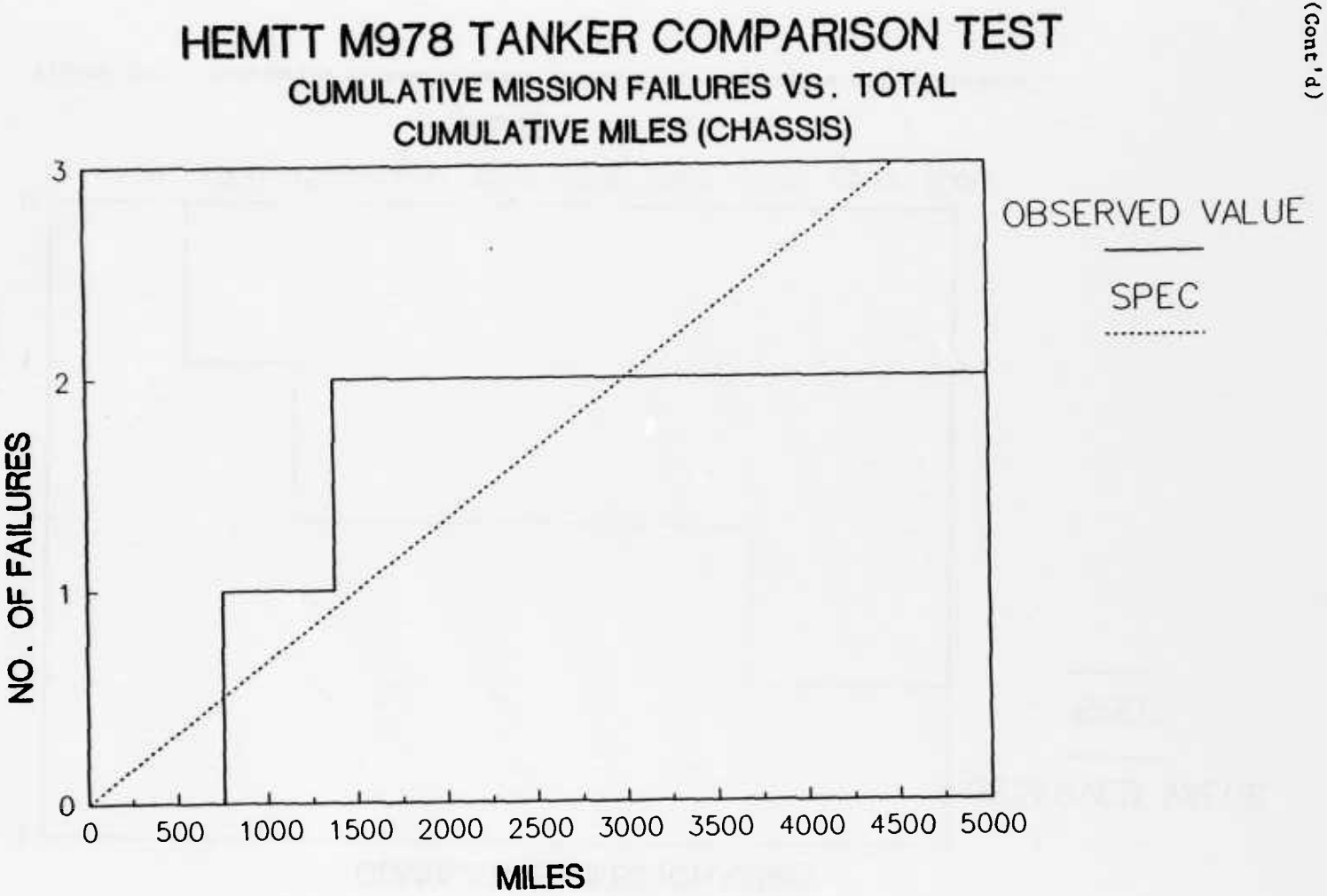

Figure 19-4. Cumulative mission failures versus total cumulative miles (chassis).

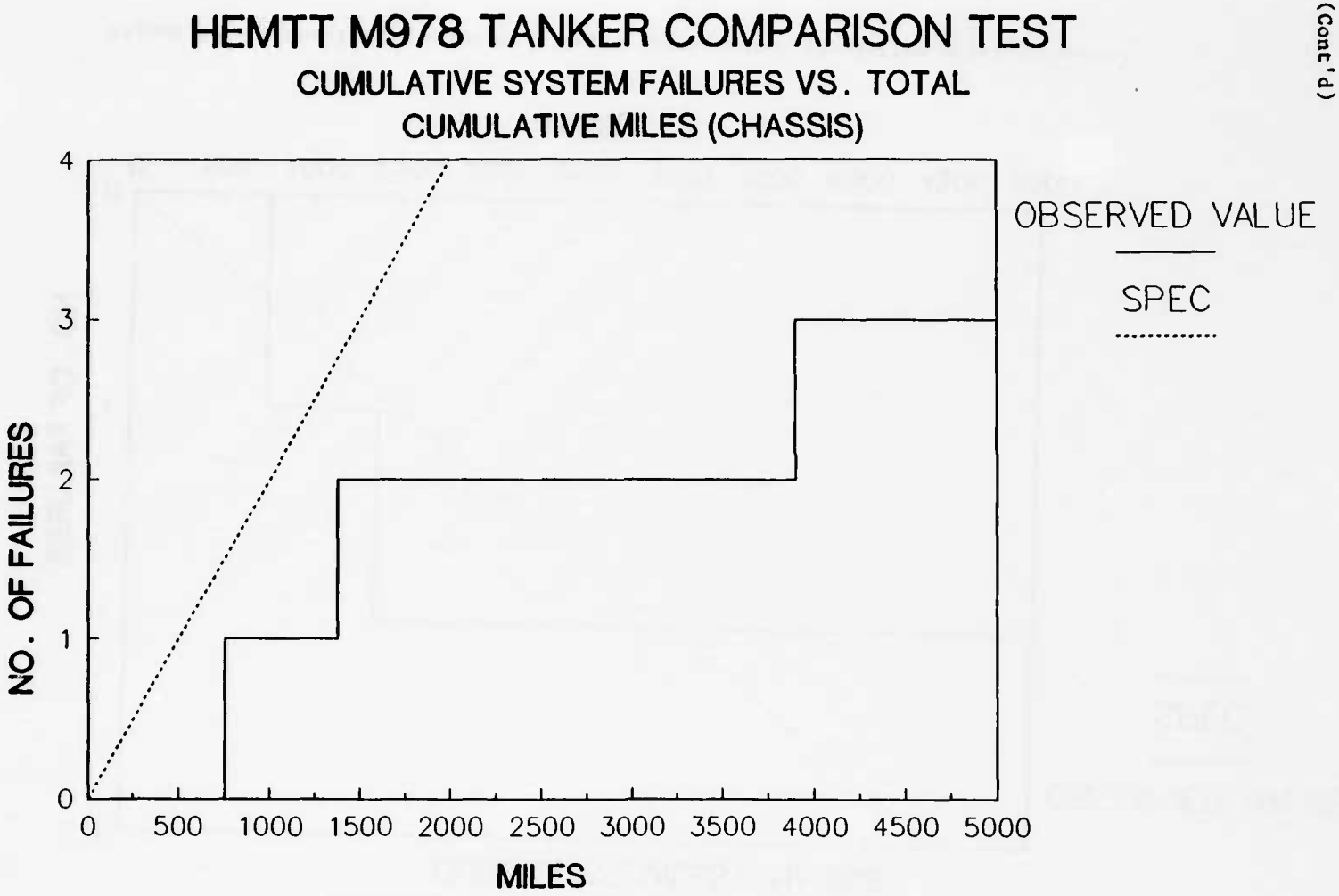

Figure 19-5. Cumulative system failures versus total cumulative miles (chassis).

19.5 (Cont'd)

d. Endurance based on operations.

(1) There were no failures requiring rebuild, overhaul, or replacement of the following components: engine, transmission, transfer case, or axles. The stipulated probability of 0.6 was met with 40% confidence. This percent confidence was the highest possible for this test due to the fact that it was only 5000 miles.

(2) There were no cracks or deformations observed which would cause a system, mission, or durability failure. The required probability of 0.9 was met with 10% confidence. As above, the percent confidence was the highest possible for this test.

(3) The criterion in paragraph 19.2b was met.

e. Analysis of test incidents.

(1) Chassis.

(a) There were two failures of the front No. 1 axle ball socket seals (both left and right). Historically (at APG) this failure has not been significant; in over 200,000 miles of testing during the past 5 years, this seal has only failed once. In addition, no subsequent failures occurred after replacement of the seals throughout the remainder of the test. Therefore, it is believed that this failure may be attributable to a quality control problem related to the manufacturer.

(b) There was one coolant leak failure. Since it was detected near the end of the test and there were no faulty parts involved, the failure was attributed to normal vibrational stresses experienced by the vehicle.

(2) Ancillary.

(a) The first ancillary system failure occurred at the pressure relief valve. Solvent loss from this valve is primarily caused by the position of the tank. When positioned on a downgrade with a full tank, pressure venting can result in some fluid escaping. This failure was assessed as a deficiency in paragraphs 5 and 17.

(b) There were two failures which were caused by the pump leaking. The source of these failures was not determined. In addition, the pump failed to meet the reliability criterion. Based on this test it is very unreliable, consequently further monitoring of the system is necessary in order to resolve its deficiencies.

(c) The last ancillary failure occurred at the V8 coupling clamp. The source of this failure was not determined. The failure was corrected by removing and inspecting the clamp. It was reinstalled and no further leak was noted, testing continued.

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REFERENCES

1. Bundy, D., Detailed Test Plan, Initial Production Evaluation/First Article Test (IPE/FAT) of Heavy Expanded Mobility Tactical Truck (HEMTT), TECOM Project No. 1-VG-120-HMT-004, May 1982.

2. Reeves, S., Final Report, Comparison Test and M978 Ancillary Test of the Heavy Expanded Mobility Tactical Truck (HEMTT), TECOM Project No. 1-VG-120-HMT-018, February 1987.

3. Letter, TACOM, AMSTA-QWH, subject: HEMTT M978 Comparison Test (CPT) TECOM Project No. 1-VG-120-HMT-028, 27 February 1988.

4. Letter, TACOM, AMSTA-QWH, subject: HEMTT M978 Comparison Test (CPT) TECOM Project No. 1-VG-120-HMT-028, 26 May 1988.

5. MIL-T-PD-977, Performance Specification, Military Tactical Truck, Truck Chassis, Truck Tractors, and Trucks Diesel Engine Drive, 62,000 to 95,000 pounds GVWR (Off Road Rating), 8x8, M977, M978, M983, M984, M984E1, and M985, Mod No. 253, July 1984.

6. DARCOM Regulation 700-15, Integrated Logistic Support (ILS), 26 November 1979.

7. TECOM Supplement 1 to DARCOM Regulation 700-15, Integrated Logistic Support (ILS), 20 June 1980.

8. MIL-STD-1472C, Human Engineering Design Criteria, Military Systems, Equipment and Facilities, 2 May 1981 with Notice 1, 1 September 1983.

9. MIL-HDBK-759A, Human Factors Engineering Design for Army Materiel, 30 June 1981.

10. MIL-STD-1474B, Noise Limits for Army Material, 18 June 1979 with Notice 1, 10 October 1980.

11. MIL-STD-209G, Slinging and Tiedown Provisions, 31 July 1986.

12. MIL-STD-882A, System Safety Program Requirements, 28 June 1977.

13. MIL-STD-461A, Electromagnetic Interference Characteristics Requirements for Equipment, 1 August 1968, with Notice 4, 9 February 1971.

14. MIL-STD-462, Electromagnetic Interference Characteristics, Measurement of, 31 July 1967, with Notice 3, 9 February 1971.

15. MIL-STD-130F, Identification Marking of US Military Property, 21 May 1982.

16. MIL-M-38784B, Manuals, Technical: General Style and Format Requirements, 16 April 1983.

17. MIL-F-46162B Fuel, Diesel Referee Grade, 14 August 1981.

18. TOP 1-1-012, Classification of Deficiencies and Shortcomings, 1 April 1979.

19. TOP 2-2-505, Inspection and Preliminary Operation of Vehicles, 14 July 1977.

20. TOP-2-2-500, Vehicle Characteristics, 3 December 1981.

21. TOP 2-2-802, Stowage, 22 January 1979.

22. TOP 2-2-508, Automotive Safety and Health Hazard Evaluation, 11 January 1980.

23. TOP 2-2-800, Center of Gravity, 18 July 1980.

24. TOP 2-2-801, Load Distribution and Ground Pressure (Wheeled and Tracked Vehicle), 7 August 1981.

25. TOP 2-2-610, Gradeability and Side Slope Performance, 18 July 1980.

26. TOP 2-2-602, Acceleration; Maximum and Minimum Speeds, 8 August 1980 with change 1, 28 January 1981.

27. TOP 2-2-604, Drawbar Pull, 18 July 1980.

28. TOP 1-2-500, Transportability, 7 February 1973 with Change 1, 22 July 1976; Change 2, 24 August 1976; and Change 3, 20 March 1979.

29. TOP 2-2-650, Engine Cold Starting and Warm-up Tests, 18 July 1980.

30. TOP 2-2-712, Automotive Winches, 27 June 1975.

31. TOP 2-2-613, Broadband Electromagnetic Interference Testing for Vehicle and Electrical Subsystems - Noncommunications, 12 October 1983.

32. TOP 2-2-506, Endurance Testing Tracked and Wheeled Vehicles, 26 June 1981.

33. TOP 1-2-610, Human Factors Engineering, 20 Dec 1977 (Part I-Procedures, Part II-Hedge).

34. TOP 2-2-614, Toxic Hazards Tests for Vehicles and Other Equipment, 17 January 1977.

35. TOP 1-2-608, Sound Level Measurements, 17 July 1981.

36. AMC Pamphlet 706-134, Maintainability Guide for Design, 3 October 1972.

37. TOP 2-2-609, Steering, 18 July 1980.

38. TOP 2-2-608, Braking, Wheeled Vehicles, 13 January 1981.

Item	Source[a]	Criteria	Applicable Subtest Paragraph	Assessment
1	Para 3.1.1.1a	Painting. The exterior and interior of all vehicle types shall be finished or painted to provide a low reflectance surface. The vehicle, body(s), and components shall be cleaned, treated, and painted as follows: (1) Clean per applicable method of TT-C-490. (2) Treat per Type I or III of TT-C-490. (3) Prime with lead and chromate-free epoxy primer, subject to approval of paint sample by Fort Belvoir, and placing of paint on Qualified Products List. (4) The topcoat paint shall be a polyurethane type conforming to MIL-C-46168(B)(ME). The final paint color shall be forest green applied in two coats at least 2 mils thick (total) without sags, runs, or thin areas. Nonferrous surfaces (1) Clean and treat aluminum per MIL-C-5541 or anodize per MIL-A-8625. Treat cadmium and zinc per Type III of TT-C-490. (2) Prime with lead and chromate-free epoxy primer, subject to approval of paint sample by Fort Belvoir, and placing of paint on Qualified Products List.	2	Met.

[a]MIL-T-PD-977, Performance Specification, July 1980.

Note: Underlined portions were not addressed.

Item	Source[a]	Criteria	Applicable Subtest Paragraph	Assessment
		(3) The topcoat paint shall be a polyurethane type conforming to MIL-C-46168(B)(ME). The final paint color shall be forest green applied in two coats at least 2 mils thick (total) without sags, runs, or thin areas. Contact areas of ferrous sheet metal .125 inch thickness and under which cannot be primed after welding or are not zinc clad steel (see 3.1.1.2), shall be primed as follows before welding: (1) Clean per TT-C-490. (2) Prime each contact surface per MIL-P-46105. All hardware not normally painted shall be treated to provide limited reflectivity.		
2	Para 3.1.1.1b	Markings. Vehicle exterior marking shall be placed and sized in accordance with MIL-STD-462 except "U.S. Army" in 3" high letters shall be used where the 5-pointed star is specified. The registration numbers on both sides and rear of the vehicle and "U.S. Army" on the vehicle front and rear are required on all vehicles. The M978 shall also have on each side and rear of the vehicle: (1) "FLAMMABLE" in 6" block letters.	2	Met.

[a]MIL-T-PD-977, Performance Specification, July 1980.

Note: Underlined portions were not addressed.

Item	Source[a]	Criteria	Applicable Subtest Paragraph	Assessment
		(2) "NO SMOKING WITHIN 50 FEET" in 3" block letters. All the markings shall be a lusterless black conforming to MIL-E-52798 or MIL-E-52929.		
3	Para 3.1.1.1c	Instruction, caution, identification, operating, and data plates. Instruction, caution, identification, operating, and data plates shall be provided and installed in accordance with the manufacturer's normal commercial practice per MIL-STD-1223. Military model number, nomenclature, national stock number (NSN), contract number, date of manufacture, manufacturer's serial number and US Army Registration number shall be embedded or embossed on an additional metal identification plate and installed in the vehicle in a readily visible location. The chassis shall be equipped with instructions, plates, or diagrams, including warnings and cautions describing any special or important procedures to be followed in assembling, operating, or servicing the chassis.	2	Met.
4	Para 3.1.1.1d	Vehicle class sign kit. A vehicle weight classification sign kit as described in MIL-S-40626 shall be installed at the front of each vehicle in a location behind the bumper that does not interfere with other vehicle functions.	2	Met.

[a]MIL-T-PD-977, Performance Specification, July 1980.

Item	Source[a]	Criteria	Applicable Subtest Paragraph	Assessment
5	Para 3.1.1.1e	Exterior model name plates and exterior trim. Exterior model name plates and ornamental trim may be eliminated, providing no holes are left.	2	Met.
6	Para 3.1.1.2	Rustproofing. Rustproofing of vehicles shall be in accordance with MIL-R-0046164. Corrosion resistant materials (zinc-clad steel, plastic materials, etc.) will be used in sills, floorboards, all flat sheet metal surfaces of the cab, and other vulnerable areas. Dissimilar materials will be treated and/or fabricated to prevent galvanic corrosion. All SAE Grade 8 threaded fasteners will have a phosphate and oil coating complying with MIL-P-16232. All SAE Grade 2 and 5 threaded fasteners will have zinc and yellow dichromate coating per QQ-Z-325, class 3, type II.		
7	Para 3.1.1.3	Transportability. Vehicles shall be equipped with lifting, towing, and tie-down devices which shall be adequate for highway, rail, sea, and air transport, in accordance with MIL-STD-209 and MIL-A-8421. Each type of truck with full load (less trailer) shall be capable of being transported by highway trailer, rail, and ocean carrier. The trucks are to be air transportable unloaded on C130, C141, and C5A per paragraphs 3.2.10 and 3.4.10.2.	7	Met.

[a]MIL-T-PD-977, Performance Specification, July 1980.

Note: Underlined portions were not addressed.

Item	Source[a]	Criteria	Applicable Subtest Paragraph	Assessment
8	Para 3.1.1.3.1	Towing eyes. Two towing eyes shall be furnished and installed on the front of each vehicle and two towing eyes shall be furnished and installed on the rear of each vehicle. Each towing eye and its mounting shall withstand a load of at least 60,000 pounds without failure or permanent deformation when the load is applied at an angle up to 45 degrees from the longitudinal axis. The towing eyes shall be of a size such that the vehicle can be towed with the medium duty towbar described in MS-500048. eyes will be located in the vertical plane of the frame side rails. Protrusion of the tow eyes into the 43^{o} angle of approach plane is permitted.	7	Met.
9	Para 3.1.1.3.2	Pintle. A towing pintle at the rear of the vehicle shall be furnished. The pintle assembly shall be of the swivel type and conform to the size and strength described in MS-51117. The assembly shall be furnished with mounting flanges and lubrication fitting. The pintle assembly mounting surface shall be forward but not more than 4 inches forward of the rear most part of the vehicle. The mounting of the pintle assembly shall include reinforcements to transfer pintle loads directly to the web of the chassis frame. Provision for attachment of	7	Met.

[a]MIL-T-PD-977, Performance Specification, July 1980.

Item	Source[a]	Criteria	Applicable Subtest Paragraph	Assessment
		trailer safety chains shall be provided as per SAE J849 (per truck installation note) for single axle trailers to be compatible with the M989 trailer which requires a one inch safety chain bracket pin. Pintle height shall be 35 inches ± 3 inches from the ground with the truck loaded to its' rated cargo capacity. Pintle height shall be appropriate to accommodate the following trailers with towbar height inches as listed: M105 (34-1/4), M149 (30 - 41), M332 (33-3/8), HEMAT (32-1/2 - 40).		
10	Para 3.1.1.4	Kits. Each vehicle shall operate in accordance with the specification requirement and the manufacturer's technical data after installation of and during the use of the kits specified herein. When specified (see paragraph 6.2) the manufacturer shall be required to furnish and install the following kits.	14	Met.
11	Para 3.1.1.4.1	Arctic Kit, Engine. This kit shall permit the vehicle to start within 45 minutes and operate within 15 minutes of starting, in a safe manner and without causing damage to the vehicle after 24 hours of cold soak under extreme climatic conditions specified in paragraph 3.1.1.5.1. Kit components and parts shall have been proven in previous commercial service or military service for extreme cold operation. Each arctic kit equipped vehicle shall have the necessary	14	Met.

[a]MIL-T-PD-977, Performance Specification, July 1980.

Note: Underlined portion was not addressed.

Item	Source[a]	Criteria	Applicable Subtest Paragraph	Assessment
		fittings, ducts, etc., to make it compatible with the vehicle. The use of external energy for component warming is prohibited. The proper application and use of the kit will in no way affect the life expectancy of the vehicle or its components.		
12	Para 3.1.1.4.2	Arctic Heater Kit, Personnel. This kit will provide a diesel fuel burning heater in addition to the standard personnel heater unit, sufficient in capacity to keep the vehicle cab at a temperature, specified in MIL-STD-1472 for personnel dressed in arctic clothing when the ambient temperatures are as low as those specified in paragraph 3.1.1.5.1. Specific temperature levels will be in accordance with human engineering practice (MIL-STD-1472 and MIL-HDBK-759). Kit components and parts shall have been proven in previous commercial or military service.		This kit was not provided.
13	Para 3.1.1.4.3	100 AMP Alternator Kit. This kit will consist of a 100 amp capacity 24 volt alternator, an output regulating device, and all other necessary mounting hardware for installation on the M983 tractor.		Not applicable to the M978.

[a]MIL-T-PD-977, Performance Specification, July 1980.

Note: Underlined portions were not addressed.

Item	Source[a]	Criteria	Applicable Subtest Paragraph	Assessment
14	Para 3.1.1.4.4	Machine Gun Mounting Kit. This kit will provide the necessary hardware for mounting of an M2 (50 cal.) machine gun above the roof of the cab either over the passenger seat or in the center of the cab without interfering with any normal driver operation. The mount will provide a full 360 degrees of traverse. The mount shall accommodate Ring Mount Assembly, M66 per drawing 7012810.		This kit was not provided.
15	Para 3.1.1.4.5	Cargo Covering. This kit will provide tarpaulin covering(s) for the cargo area of the vehicle conforming to MIL-C-20696 (Type II, Class 2 only). Such covering(s) shall be totally detachable from the vehicle, along with necessary supports. The overall height of the vehicle (with bows and tarps installed) shall be no more than 11 feet 11 inches in the cargo portions of the Type A and D vehicles. The cargo covering color will be lusterless forest green and have the infrared reflectance properties of MIL-E-52798.		Not applicable to the M978.
16	Para 3.1.1.4.5	Gas Particulate Filter Unit. This kit will provide the necessary hardware and power hook-up provisions for the mounting of the M2A2 filter unit and two M3 air heater units in the cab of the vehicle.		This kit was not provided.

[a]MIL-T-PD-977, Performance Specification, July 1980.

Note: Underlined portions were not addressed.

Item	Source[a]	Criteria	Applicable Subtest Paragraph	Assessment
17	Para 3.1.1.4.7	Chemical Alarm kit. Configure and install an M-8 Chemical Alarm Unit in the vehicle cab using the components provided as Government Furnished Property listed at Section H.26 of the contract. The detector unit will be installed in an M182 low profile mount on the interior of the cab. As necessary, design and provide any components which are required to complete successful interface of the M-8 unit into the HEMTT family of vehicles. Provide installation drawings plus component drawings and parts lists for all components of the M-8/vehicle interface. The contractor will design, fabricate, and install the electrical cable to supply vehicle power (28 +/- 8 VDC) to the M182 mount for operation of the detector unit. The contractor will make provisions to incorporate the M42 alarm unit as well as the M256 Chemical Agent Detector Kit in the cab as a stowable item. Drill holes as required to mount equipment allowing for installation of grommets in the holes for passage of required power cables. Mounting holes will be drilled and plugged to accommodate installation of units in the field by the user. An installation drawing will be provided to ensure correct installation by the user.		This kit was not provided.

[a]MIL-T-PD-977, Performance Specification, July 1980.

Note: Underlined portion was not addressed.

Item	Source[a]	Criteria	Applicable Subtest Paragraph	Assessment
18	Para 3.1.1.4.8	M16 Rifle Mounting Kit. This kit will provide the necessary hardware for the mounting of two government-furnished rifle mounting kits inside the cab, one on each door. The government furnished kits will include two each of the following NSNs: 2590-00-264-8824 support, rifle; 2540-00-455-5903 catch assy, rifle; 1450-00-455-5899 bracket, catch mount. Holes will be provided for attachment of all items to the doors and will be filled with threaded fasteners.		This kit was not provided.
19	Para 3.1.1.4.9	M13 Decontamination Apparatus Kit. This kit will provide the necessary hardware for mounting one government-furnished decontamination apparatus NSN 4230-01-133-4124 to a fender. Holes will be provided for attachment of the bracket assembly NSN 2590-00-473-6331 to the fender.		This kit was not provided.
20	Para 3.1.1.5	Climatic conditions. The vehicle shall be capable of starting and operating within 30 minutes in ambient temperatures from -25 degrees F to +120 degrees F and from -500 feet through +1200 foot altitude using only those onboard aids described in paragraph 3.4.1.6.	14	Not met. Failures of the fuel dispensing system prevented fueling operations at low temperatures.

[a]MIL-T-PD-977, Performance Specification, July 1980.

Note: Underlined portions were not addressed.

Item	Source[a]	Criteria	Applicable Subtest Paragraph	Assessment
21	Para 3.1.1.5.1	Climatic design type (cold). The vehicle shall be capable of starting within 45 minutes and operating in a safe manner and without causing damage to the vehicle within 15 minutes after starting in ambient temperatures of -25 °F to -50 °F with arctic kit (see para 3.1.1.4.1) installed. Kit components and parts shall have been in previous commercial or military service.	14	Not met. See item 20.
22	Para 3.2.1	Safety. Vehicles and furnished accessories shall comply with all Federal Motor Vehicle Safety Standards and Carrier Safety Regulations, in effect on the date of contract award, as stated in MIL-STD-1180, Safety Standards for Military Ground Vehicles. The safety characteristics of the vehicles shall also meet the following requirements.	17	Not met. One safety deficiency and seven safety shortcomings were assessed.
		a. For exposed components and systems which are subject to high temperatures and high pressures, which are electrically actuated or inherently hazardous, the safety characteristics shall provide safeguarding and insulating features.	17	Not met. The fan shroud does not encircle the blades, access to the battery box is limited, and there is no electrical master switch.
		b. Step surfaces shall provide a nonskid footing.	17	Not met. Both the permanent and moveable ladders lacked nonskid surfaces.

[a]MIL-T-PD-977, Performance Specification, July 1980.

Note: Underlined portion was not addressed.

Item	Source[a]	Criteria	Applicable Subtest Paragraph	Assessment
		c. Non-functional sharp edges, projection points, and excessive length of fasteners shall be eliminated.	17	Not met. Sharp edges existed on the top of the moveable ladder.
23	Para 3.2.2	Human factors. The vehicle design shall include established human factors design practices per in MIL-STD-1474, MIL-STD-1472, MIL-HDBK-759, and appropriate SAE standards and recommended practices. Specific requirements are:	16	Not met. See subparagraph a.
		a. The vehicle shall be operable and maintainable by the full range of Army personnel (5th percentile female through 95th percentile male), wearing the full range of Army clothing. All hand holds and steps necessary for the operator and maintenance personnel to gain access to the various locations on the vehicle shall be an integral and permanent part of this vehicle, with the exception of a moveable ladder to provide access to both sides of the windshield for cleaning and to the top of the vehicle work area from both sides. The ladder to be stored in a readily accessible location.	16	Not met. Four shortcomings were assessed against the design of the vehicle with regards to Human Factors Engineering.
		b. Crew environmental factors (heating, ventilation, toxic fumes, lighting, noise, vibration, and shock) shall not degrade mission performance or cause health hazards.	16	Met.

[a]MIL-T-PD-977, Performance Specification, July 1980.

Note: Underlined portions were not addressed.

Item	Source[a]	Criteria	Applicable Subtest Paragraph	Assessment
24	Para 3.2.3	Air/sound pollution.	16	Not met. See subparagraph c.
		a. Vehicles shall comply with the Environmental Protection Agency regulations governing control of air pollution from new motor vehicles and new motor vehicle engines, in effect on the date of contract award.		
		b. The interior sound level shall conform to Federal Motor Carrier Safety Regulation 393.94. The vehicle exterior sound level shall conform to the Interstate Motor Carrier Noise Emission Standards of the Environmental Protection Agency when tested in accordance with the regulations of the Department of Transportation, part 325.		
		c. Vehicles shall also comply with both the exterior and interior noise limits outlined in MIL-STD-1474. The exterior sound level limits shall not be exceeded when measured according to the test procedure cited in SAE J366. The steady state interior noise levels in personnel occupied areas shall not be exceeded when measured by MIL-STD-1474 with a steady state noise category of D. The personnel occupied areas shall be the following: each operator and crew position and occasionally occupied positions.	16	Not met. Steady-state interior noise levels exceeded category D.

[a]MIL-T-PD-977, Performance Specification, July 1980.

Note: Underlined portions were not addressed.

Item	Source[a]	Criteria	Applicable Subtest Paragraph	Assessment
25	Para 3.2.4	Curb weight. The curb weight of the chassis shall include the weight of the chassis and cab (excluding mounted body and equipment) including complete fuel, winches, lubricants, and coolants. The curb weight of the chassis (all body types) shall not exceed 26,000 lbs except that the M984 chassis weight may exceed 26,000 lbs provided the complete M984E1 vehicle does not exceed C130 air transport weight limitations (Reference AFSC DH 1-11 Chapter 5). The curb weight of each vehicle shall be kept to a minimum following the best commercial practice. The curb weight of the vehicle shall include chassis curb weight plus the weight of all mounted equipment. Light vehicles consistent with durability are preferred.		Not evaluated.
26	Para 3.2.10	Dimensions in the unloaded condition shall be as follow:	4	Not met. See subparagraphs d and g.
		a. Overall operating of the trucks shall not exceed 114 inches with the exception of kits per 3.1.1.4.4 and 3.1.1.4.5.	4	Met.
		b. Cab and body heights less spare tire, exhaust and intake stacks are to be such that all trucks are inherently air transportable in C130 or C141 aircraft.	4	Met.

[a]MIL-T-PD-977, Performance Specification, July 1980.

Note: Underlined portion was not addressed.

Item	Source[a]	Criteria	Applicable Subtest Paragraph	Assessment
		c. All body types shall height reducible for air transport. Preparation of basic vehicle for air transportation shall be accomplished in 15 minutes total or less by no more than two individuals using only common hand tools and onboard equipment. Kits are exempt from this requirement. No crane preparation is allowed. However, 120 minutes total is permitted by two individuals to repare the M984E1 wrecker for air transportation. Equipment removed from M984 and the spare tire from the M978 may be stored directly on the aircraft.	4	Met.
		d. Overall vehicle width 96 inches. Minimum cargo body inside dimension between vertically mounted drop sides is 90 inches.	4	Not met. Overall vehicle width was 101.3 in.
		e. The wheelbases of chassis types are shown in table I. The wheelbase for the chassis Type I may be shortened for chassis Type II (body type E) Truck Tractor for maximum maneuverability with its' XM986 GLCM Semitrailer, XM860 Patriot Semitrailer and XM790 Pershing II Semitrailer (see Appendix A, B, and C, respectively).		Not applicable to M978.
		f. The overall length of the Type II Chassis Truck Tractor, when coupled to the XM986 GLCM Semitrailer, shall not exceed 55 feet, and when coupled to the XM790 Pershing II Semitrailer, shall not exceed 55 feet. The swing radius (SR) and clearance (CT) minimum dimensions shall comply with SAE J701.		Not applicable to M978.

[a]MIL-T-PD-977, Performance Specification, July 1980.

Note: Underlined portions were not addressed.

Item	Source[a]	Criteria	Applicable Subtest Paragraph	Assessment
		g. Overall clearances. The angle of approach shall not be less than 43° and the angle of departure shall not be less than 39° in the area of the pintle hook.	4	Not met. The angle of approach was 41°.
		The minimum ground clearance shall not be less than 13 inches (14 inches desirable) under the center of the axles nor less than 20 inches between the number 2 and 3 axles, loaded or unloaded and with or without a recovery winch.	4	Met.
27	Para 3.2.10.8	Axle weight distribution, as specified in MIL-A-8421 for the C130/C141 shall be obtainable without disassembly (other than those items specified in 3.2.10c).	8	Met.
28	Para 3.2.13	Vehicle clearance circle. Each vehicle clearance circle shall not exceed 6 times the vehicle wheelbase when measured per SAE J695 but in no case will turning diameter (curb to curb) exceed 100 feet. The type II chassis with M860 and M790 semitrailers in road march configuration shall be able to negotiate a right angle turn posed by an intersection of two road beds 24 feet wide (wall to wall) without stopping. Stopping/backing is allowed in negotiations of the above turn with M986 trailer in tow.	6	Met.

[a]MIL-T-PD-977, Performance Specification, July 1980.

Note: Underlined portions were not addressed.

Item	Source[a]	Criteria	Applicable Subtest Paragraph	Assessment
		a. Vehicles with applicable towed trailer and/or semitrailer respectively shall start on and climb a 30% grade at GCW (adequate traction assumed). If a torque converter is provided the vehicle must start and after initial acceleration climb the grades specified while maintaining the converter efficiency factor established by the manufacturer for continuous duty. If a torque converter is not provided the vehicle must be capable of starting on a 30% grade without deviating from normal starting procedures. Vehicle shall have gearing and torque capable of meeting the minimum gradeability requirements. Note: gradeability shall be met using Class I good roads per SAE J688.		
		b. Vehicle of the Type chassis without towed load, body types A, B, C, & D shall be further capable of starting on and climb (in forward direction) a 60% grade at GVW (adequate traction assumed). This shall be a performance rather than a durability requirement. If a torque converter is provided the vehicle must start and after initial acceleration climb the grades specified while maintaining the converter efficiency factors established by the manufacturer for continuous duty. If a torque converter is not provided, the vehicle must be capable of starting on a 60% grade without deviating from normal starting procedures. Vehicle shall have gearing and torque capable of meeting the minimum gradeability requirements. Note: Gradeability shall be met using Class I good roads per SAE J688.	5	Met.

[a]MIL-T-PD-977, Performance Specification, July 1980.

Note: Underlined portions were not addressed.

Item	Source[a]	Criteria	Applicable Subtest Paragraph	Assessment
		c. Vehicles shall maintain speeds on Class I good roads (per SAE J688 and J816) on a 3% grade as follows (if a multi-speed transfer case is provided this performance must be in high range or direct drive range):	10	Met.
		(1) Type I, III, IV, and V chassis, with full trailer, 100,000 lbs GCW: 25 mph.		
		(2) Type II chassis, tractor with semitrailer, 100,000 lbs GCW: 25 mph.		
		(3) Type I, III, IV, and V chassis, truck only 60,000 lbs GVW: 40 mph.	10	Met.
		d. Vehicles shall be capable of maintaining sustained speeds on Class I good roads (per SAE J688 and J816) on a 2% grade as follows:	10	Met.
		(1) Type I, III, IV, and V chassis, with full trailer, 100,000 lbs GCW: 35 mph.		
		(2) Type II chassis, tractor with semitrailer, 100,000 lbs GCW: 35 mph.		
		(3) Type I, III, IV, and V chassis, truck only, 60,000 lbs GVW: 50 mph.	10	Met.
		e. Each vehicle shall be capable of maintaining sustained speeds on level Class I good roads (per SAE J688) of not less than 55 mph at the GCW.	10	Met.

[a]MIL-T-PD-977, Performance Specification, July 1980.

Note: Underlined portions were not addressed.

Item	Source[a]	Criteria	Applicable Subtest Paragraph	Assessment
		Vehicles shall meet above requirements based upon calculations in accordance with SAE J688 and J816 using the factors contained in 6.5, Truck Ability Prediction Procedures, using class of roads specified above.		
30	Para 3.3.2	Governed speed. Maximum geared speed at engine full load governed speed shall not be less than 55 mph for Types I thru V vehicles. Engine governed speed will not exceed the maximum RPM rating specified by the engine manufacturer.	10	Met.
31	Para 3.3.3	Side slope operation. All vehicle types without towed load shall be capable of operation headed up and headed down slope on longitudinal grades as specified in 3.3.1 and side slopes up to 30% with each side of the vehicle up slope. As a result of the operation, no evidence of faulty lubrication, leakage or other malfunction shall be found.	5	Not met. On grades steeper than 15%, fuel leaked from the overpressure relief valve at the top front of the tank.
32	Para 3.3.4	Service brakes. Service brakes shall meet the requirements of Section 393.52 of Federal Motor Carrier Safety Regulations and Dept of Transportation Regulations for heavy duty trucks (FMVSS121). The service brakes will also stop and hold the truck on a 60% grade on dry concrete when the truck is loaded to its GVW, pointing either uphill or downhill.	5	Met.

[a]MIL-T-PD-977, Performance Specification, July 1980.

Note: Underlined portions were not addressed.

Item	Source[a]	Criteria	Applicable Subtest Paragraph	Assessment
33	Para 3.3.5	Parking brake. A parking brake shall be furnished and shall conform to the Federal Motor Carrier Safety Regulation 393.41 and hold it own GVW on a 20% grade (40% desirable), pointing either uphill or downhill.	5	Met.
34	Para 3.3.6	Fording. The vehicle, without prior preparation, shall ford hard-bottom water crossings to a depth of 48 inches for not less than 5 minutes duration without damage or additional maintenance prior to further operation, and no contamination of lubricants in those enclosures which are designed to exclude contaminants. Pressurization of the air braking system to meet the fording requirement is allowed. Spring loaded vent valves shall be used on all axle housings.	13	Met.
35	Para 3.3.8.1	Reliability. The vehicle, exclusive of material handling system, recovery system, fifth wheel and fuel loading/dispensing system while operating within the environment specified, shall utilize a Best Operational Capability (BOC) of 3000 Mean Miles Between Mission Failure (MMBMF) and shall have a minimum acceptable value (MAV) of 1500 MMBMF. The vehicle shall also utilize a BOC of 1000 Mean Miles Between System Failure (MMBSF) and shall have a MAV of 500 MMBSF.	19	Met.

[a]MIL-T-PD-977, Performance Specification, July 1980.

Note: Underlined portion was not addressed.

Item	Source[a]	Criteria	Applicable Subtest Paragraph	Assessment
36	Para 3.3.8.2	Maintainability. The maintenance ratio (MR) for the basic chassis shall not exceed 0.23 at an average vehicle speed of 15.2 miles per hour (mph). This shall be demonstrated on a basic chassis operating for a total test time of 20,000 miles plus a composite engine idle time necessary to operate the various ancillary equipment. If, during test, the average mph is other than the specified, the MR operating hours will be normalized to coincide with the specified mission profile. Any scheduled and/or unscheduled maintenance performed on the ancillary equipment during test will not be included in the basic chassis MR. All type vehicles of this family shall be designed so that the following can be removed from the vehicle and replaced in under four hours by a 4-man crew. a. Transfer Case. All type vehicles of this family shall be designed so that each of the following can be removed from the vehicle and replaced in under four and one half hours by a 4-man crew. b. Engine (only). c. Transmission (only). d. Engine-Transmission Assembly.	18	Met.

[a]MIL-T-PD-977, Performance Specification, July 1980.

Item	Source[a]	Criteria	Applicable Subtest Paragraph	Assessment
		The four hour criteria includes all preparation, i.e. hood removal, tilting the cab or draining fluids, etc. Routine daily maintenance checks, i.e. engine oil, coolant level, battery liquid level, etc., must be readily accessible without the use of tools. Preoperation fluid level checks shall not take longer than 5 minutes. Components of the chassis shall be accessible for servicing, repair and replacement. Ease of maintenance provisions shall incorporate features insuring operating clearances and facilitating maintenance and service operations. The vehicle design shall incorporate maintainability design principles per AMC Pamphlet 706-134.		
37	Para 3.3.8.3	Durability. The vehicle, exclusive of material handling systems, recovery systems, fifth wheel, and fuel loading/dispensing systems shall:	19	Met.
		a. Have not less than a 0.6 probability of completing the first 32,000 kilometers (20,000 miles) of operation without overhaul, rebuild, or replacement of any of the following components: (1) Engine. (2) Transmission. (3) Transfer Case. (4) Axles.	19	Met.

[a]MIL-T-PD-977, Performance Specification, July 1980.

Note: Underlined portion was not addressed.

Item	Source[a]	Criteria	Applicable Subtest Paragraph	Assessment
		b. Have not less than a 0.9 probability of completing the first 32,000 kilometers (20,000 miles) of operation without cracking or significant deformation (will not cause a system failure, mission failure, or durability failure) of the frame and major supporting members.	19	Met.
38	Para 3.3.9	Nuclear, Biological, and Chemical (NBC) warfare and Nuclear Weapons Effects (NWE). NWE protection (Only high altitude and low level Electromagnetic Pulse (EMP)) will be required on Type II chassis (Body Type E) and Type IV and Type V chassis (Body Type C) vehicles designated for Pershing use. All other vehicles will be hardened against high altitude Electromagnetic Pulse. The specific levels of protection for all cases are classified confidential. NBC protection (Paint & power and space for M8A3 Filter Kit) will be required on all vehicles.		Not evaluated at CSTA.
39	Para 3.4.1	Engine. The engine furnished shall be of the compression ignition type, either 2 stroke cycle or four stroke cycle, either liquid cooled or air cooled and not less than six cylinders. Generally the engine must fall into the category of a heavy duty truck engine. The engine must be a commercially proven item and conform to Federal (U.S.) emission standards. The net engine horsepower figures used in performance prediction calculations shall be	2	Met.

[a]MIL-T-PD-977, Performance Specification, July 1980.

Note: Underlined portions were not addressed.

Item	Source[a]	Criteria	Applicable Subtest Paragraph	Assessment
		determined in accordance with SAE J816. The selected engine must pass the 400 hour NATO test which includes running on high sulfur fuel (1+/- .05%). The net effect of the preceding criteria is to maximize fuel economy and minimize the size of the induction system, exhaust system and cooling system. The brake specific fuel consumption of the engine with standard fuel in an emission certified configuration shall not exceed (1) .370 lb/HP Hr when operated at 100 percent load at maximum torque speed and (2) .380 lb/HP Hr when operated at 100 percent load from maximum torque speed to maximum power speed.		
40	Para 3.4.1.1	Heavy duty cooling system, liquid cooled. A heavy duty cooling system shall be furnished. The cooling system shall maintain the top tank coolant at a temperature recommended by the engine manufacturer but not more than 220 degrees F when operated under the conditions outlined herein in all speed ranges. The radiator pressure cap shall be integrated with the engine manufacturer's overall coolant system recommendation for best commercial practice. The cooling system shall pass the engine manufacturer's cooling test in the installed configuration in ambient air temperature of 120 degrees F. If the radiator cooling system is used to cool the retarder and/or transmission systems, the cooling system	2	Met.

[a]MIL-T-PD-977, Performance Specification, July 1980.

Note: Underlined portions were not addressed.

Item	Source[a]	Criteria	Applicable Subtest Paragraph	Assessment
		shall be capable of adequately cooling these components in addition to the engine as described above at the load/throttle requiring greatest heat rejection. It shall have thermostatic controls for controlling the flow of engine coolant through the radiator. The cooling system shall be adequate to cool all the previously specified components while the truck operates at a .6 tractive effort to actual weight ratio of the M985 in 120 °F ambient air at Wide Open Throttle (WOT). All coolant hoses shall be equal to or better than required by MIL-H-62217 & Federal Spec ZZ-H-428, secured with stainless steel worm gear type hose clamps in accordance with SAE J536, Type F, style 4.		
41	Para 3.4.1.1.2	Cooling system and indicators, liquid cooled. The coolant system shall include a de-aeration or equivalent system of sufficient capacity to handle the coolant draw down as required by the engine manufacturer or a coolant recovery reservoir of not less than 5% of the total coolant system capacity. A high coolant temperature warning light or buzzer shall be provided in addition to a temperature gage. The reservoir shall be located in a position readily accessible for inspection and service.	2	Met.

[a]MIL-T-PD-977, Performance Specification, July 1980.

Note: Underlined portion was not addressed.

Item	Source[a]	Criteria	Applicable Subtest Paragraph	Assessment
42	Para 3.4.1.4	Governor. Engine governor shall be furnished sealed to provide indication of tampering and limit set to engine manufacturer's maximum recommended operating speed. Governor control linkage (foot throttle) shall be adjustable to permit variable adjustment of engine rpm. The accelerator control system shall conform to FMVSS 124.	2	Met.
43	Para 3.4.1.6	Engine starting. An ether injection system and/or a fixed preheating system shall be provided. If an ether system is to be used, the following design characteristics shall be implemented per MIL-E-52649: a. The system shall be a permanent fixture allowing ether to be injected directly through a closed system to the engine intake. b. Release of the ether shall be done remotely. c. A metering system shall limit the amount of ether to the engine. d. A thermal switch shall be incorporated to prevent ether injection when the engine is operating or sufficiently warm for unassisted starting.	14	Met.

[a]MIL-T-PD-977, Performance Specification, July 1980.

Note: Underlined portions were not addressed.

Item	Source[a]	Criteria	Applicable Subtest Paragraph	Assessment
44	Para 3.4.2.1	Starting and lighting system. A 24 volt lighting and a 24 volt starting system with an alternator type charging system shall be furnished. The alternator shall provide sufficient amperage (when operating at engine idle speed) to operate all electrical components of the tractor and semitrailer. System will incorporate reverse polarity protection and means to prevent starter engagement with engine running. The vehicles will have slave start capability from other military or similar type vehicles. Intervehicle slaving connections will be accomplished through Cable & Plug Assembly, Intervehicle Power Cable No. 11682336-1 with Power Cable Connector Assembly No. 11682338 and Vehicle Receptacle Assembly No. 11682345 and Installation Drawing No. 11674728. The vehicle shall also be able to slave start MIL-STD-633 generator sets, particularly the MEP104A, see paragraphs 3.4.13.1.11. and 3.5.5.14.	2	Met.
45	Para 3.4.2.2	Lighting. All vehicle lights, reflectors, and wiring shall be specified herein and in accordance with MIL-STD-1179. Lights and reflectors shall not be mounted on vehicle bumpers (FMVSS 108 headlight height does not apply). Rear lighting shall be mounted in a	2	Met.

[a]MIL-T-PD-977, Performance Specification, July 1980.

Note: Underlined portion was not addressed.

Item	Source[a]	Criteria	Applicable Subtest Paragraph	Assessment
		protective location to preclude damage when interfacing with other vehicles or ancillary equipment. Polycarbonate lense shall be provided in all lights except sealed beam headlights and service lights. Light control switches must be of a design which permits extinguishing the marker lights on the truck and trailer (when equipped to tow trailers) separate from the service lights per FMVSS 108. All vehicles shall be equipped with a blackout and marker lighting system. In the event there is a conflict between MIL-STD-1179 and DOT requirements, MIL-STD-1179 will take precedence. The M978 tanker body shall have an enclosed weatherproof exterior system (clearance and marker lights). Front turn signals shall be provided that are visible from the side of the vehicle.		
46	Para 3.4.2.4	Batteries. A minimum of four 12 volt storage batteries shall be furnished per MIL-B-11188. The battery mounting and enclosure shall provide space for either low maintenance or standard military batteries with protection from the environment and contaminants in accordance with MS35000. <u>The cold cranking amperage at 0 degrees F shall be in accordance with RCCC-RP No. 109.</u>	2	Met.

[a]MIL-T-PD-977, Performance Specification, July 1980.

Note: Underlined portion was not addressed.

Item	Source[a]	Criteria	Applicable Subtest Paragraph	Assessment
47	Para 3.4.2.5	Electromagnetic emission. The tractor shall meet the requirements of MIL-STD-461 notice 4, REO5 and CEO7 steady state conducted emissions over a frequency range of 30 MHz thru 75.95 MHz; RSO3 except for electrical controls which have an alternate manual backup capability, i.e. crane remote controls, 100 volts per meter vertically polarized and 10 volts per meter horizontally polarized over a frequency range of 200 KHz to 10 MHz, 100 volts per meter for both horizontally and vertically polarized waves over a frequency range of 10 MHz to 100 MHz and 200 volts per meter for both horizontally and vertically polarized waves over a frequency range of 100 MHz to 11 GHz. All other vehicle types shall comply with the requirements for class C1 equipment and systems as per MIL-STD-461B, UMO3 steady state radiated emissions over a frequency range of 30 to 75.95 MHz.	15	Not met. Radiated emissions from the low-air warning buzzer and horn failed to meet the requirements of MIL-STD-461B.
48	Para 3.4.2.7	Diagnostic Connector Assembly (DCA). The vehicle will incorporate an easily accessible DCA for Simplified Test Equipment/Internal Combustion Engine (STE/ICE) per MIL-T-62314 appendix B. The Diagnostic Connector TARADCOM DRWG 12258941 on the vehicle will interface with the STE/ICE Test Equipment.	2	Met.

[a]MIL-T-PD-977, Performance Specification, July 1980.

Note: Underlined portion was not addressed.

Item	Source[a]	Criteria	Applicable Subtest Paragraph	Assessment
49	Para 3.4.3.1	Fuel tanks. All vehicle types shall be equipped with corrosion resistant fuel tank(s) adequate to provide a minimum 300 mile operating range based on the rated GCW traveling over a mix of terrains as specified in Table II. When more than one tank is furnished means shall be provided to assure equalized fuel level an draw in both tanks. A manual shutoff valve shall be furnished if two tanks are utilized. Fuel tank(s) will be provided with minimum 3 inch diameter safety type tank filler cap or caps, which can be grasped and removed/installed with arctic mittens. Filler caps shall be located to preclude mud build up and captive chained to filler neck. Removable strainers are required. A sealed filler cap & vent is required for fording requirements. Fuel tank capacity shall be 150 gal plus suitable air space.	2	Met.
50	Para 3.4.4	Exhaust system. The exhaust system shall conform to Federal Motor Carrier Safety Regulations 393.83. The exhaust system as installed shall be gas tight and leakproof to prevent the accumulation of exhaust gas in the occupied areas in accordance with best commercial practice. The preferred tail pipe(s) location shall be a vertical stack at the rear of the cab. The tail pipe(s) shall be	12	Met.

[a]MIL-T-PD-977, Performance Specification, July 1980.

Note: Underlined portions were not addressed.

Item	Source[a]	Criteria	Applicable Subtest Paragraph	Assessment
		configured to prevent entry of rain water when vehicle is not operating. Exhaust mufflers and tail pipes shall be corrosion resistant and shall be furnished with adequate guards to prevent personnel contact while operating winches and other equipment mounted, or intended to be mounted, entering and exiting the cab, and normal entry and exit of the rear deck.		
51	Para 3.4.5.1	Transmission. The transmission shall be an automatic as defined in SAE J645 with not less than four (4) forward and 1 reverse gear ranges and must have a gear range capable of meeting the performance specification as stated herein. Manually operated gear reduction devices integral to or separate from the automatic transmission may be utilized to achieve the overall gear reduction required for operation under adverse conditions and to meet cooling requirements, as specified in paragraph 3.4.1.1. The main transmission shall include the following: a. A downshift inhibitor system that prevents driver shift control action from overspeeding or damaging the engine, transmission, or drive train components. b. A readily accessible transmission oil filter, (if recommended), and heat exchange, if required, for the intended truck application.	2	Met.

[a]MIL-T-PD-977, Performance Specification, July 1980.

Item	Source[a]	Criteria	Applicable Subtest Paragraph	Assessment
		c. A neutral start switch. d. A gated type driver control with detent and identification of all shift levers and patterns. The PTO shall have a positive neutral to prevent accidental engagement. e. Gear selector shall be illuminated to provide visibility of ranges under all conditions. f. A neutral interlock switch shall be provided on all crane-equipped vehicles and on the M978 to prevent actuation of the engine throttle at the crane or tanker control station(s) unless the transmission is in neutral and the hydraulic pump PTO is engaged.		
52	Para 3.4.5.2	Torque Transfer and Control System. The torque transfer system shall have the capability of providing drive to all axles to meet the required vehicle performance and be appropriately rated for torque and power. The system shall have a pressure lubrication system to guard against seizure in case of spinout. The system shall have the provision to provide lockup capability of all inter-axle differentials. If a two-speed drive system is utilized, either accomplished within this system or by other drive line components to meet the described vehicle performance needs,	2	Met.

[a]MIL-T-PD-977, Performance Specification, July 1980.

Item	Source[a]	Criteria	Applicable Subtest Paragraph	Assessment
		the inter-axles lockup shall be driver controlled and operable in either high or low range. The drive system shall permit 8x8 drive in either high or low transfer gear range. The 8x8 drive shall be automatically engaged when the transfer is shifted into low range. A warning light shall be located on the cab dash panel to alert the driver when he is in 8x8 lockup mode.		
53	Para 3.4.5.3	Retarder. A power train retarding device with modulated driver control shall be provided which shall provide, when with other commercially accepted methods of braking augmentation, at least 300 retarding horsepower to the overall vehicle retarding requirement at an engine speed acceptable to the engine manufacturers. In addition, if the retarder has interface with the engine, it shall be approved by the engine manufacturer and shall not by its operation cause an exhaust back-pressure which exceeds the engine manufacturer's allowable limit. Retarder will be variable self-cancelling (including accelerator treadle) type operated by a foot pedal to be operated by the driver. Optionally a self-cancelling (spring loaded) foot control will be acceptable if provided with a yellow warning light which goes on when the retarder is engaged.	2	Met.

[a]MIL-T-PD-977, Performance Specification, July 1980.

Item	Source[a]	Criteria	Applicable Subtest Paragraph	Assessment
54	Para 3.4.5.4	Power takeoff openings. Heavy Duty Power Takeoff (PTO) capability will be provided on each Type I thru Type V chassis vehicle. The PTO openings will be utilized for the purpose of driving chassis mounted truck hydraulic and mechanical equipment. On the M983 tractor one of the PTO locations must be of sufficient capacity to deliver a minimum of 100 hp (150 desirable) while the vehicle is in motion. The PTO will be suitable for power assisted semitrailer axles which would be driven hydraulically from this PTO per SAE J705.	2	Met.
55	Para 3.4.7.3	Traction Control. An accepted off-highway commercial traction control device shall be required in at least two axles of the vehicle without compromise to vehicle steering. The traction control shall insure that power is transmitted to the wheel having traction when the opposite wheel loses traction and may be of an automatic type. If a full locking or controllable biasing traction control device is utilized, it shall feature a manual engagement control and further feature automatic disengagement to preclude axle damage or unsafe vehicle condition in the event excessive vehicle speeds are attained. The device or method shall not degrade axle durability for the life of the vehicle, and if provided by other than the axle manufacturer, shall be certified for rating and application by both axle and device manufacturers.	2	Met.

[a]MIL-T-PD-977, Performance Specification, July 1980.

Note: Underlined portion was not addressed.

Item	Source[a]	Criteria	Applicable Subtest Paragraph	Assessment
56	Para 3.4.8.1	Tires and tubes. Vehicles shall be equipped with (eight + one spare) nine radial ply tires capable of supporting the vehicle at the rated GVWR. Aggressive tread pattern, compatible with highway operation (ride and wear requirements), is required to meet off-road mobility requirements. Valve caps shall be provided. Tubes are not required unless specifically recommended by the tire manufacturer and all tires must be equipped with adequate valve extensions and be so mounted as to permit checking tire pressure and inflation using only on vehicle equipment (see paragraphs 3.4.13.1.4 and 3.4.13.1.5).	2	Met.
57	Para 3.4.8.2	Spare tire and wheel assembly. Spare wheel and tire assembly shall be provided for each vehicle and shall be capable of being installed on either front or rear axles. A spare tire carrier shall be furnished and mounted for each type vehicle in readily accessible location and shall be mounted in such a fashion that the tire can be removed and replaced by a crew of two. Vehicles will be supplied with a davit to facilitate spare tire handling.	2	Met.

[a]MIL-T-PD-977, Performance Specification, July 1980.

Item	Source[a]	Criteria	Applicable Subtest Paragraph	Assessment
58	Para 3.4.9	Brakes. Brakes shall conform to Federal Motor Carrier Safety Regulations 393.40 through 393.42(b), 393.43 and 393.45 through 393.52. The performance of the brake system shall comply with FMVSS-121 except that the anti-lock system shall not be furnished. All brakes will be releasable from the cab in the tactical environment in the event of emergency lockup. The rear axle brakes shall be at least 16-1/2 inch X 7 inch in size and compatible with a rear tandem off road load rating of 38,000 lbs.	9	Met.
59	Para 3.4.9.1	Service brakes. Vehicle shall be equipped with air brakes. Air/hydraulic combination also permissible, if in conjunction with "S" cam type axles and disk type brakes. Brake apply cylinders/"cams" and the associated lines shall be located to minimize exposure to "road hazards" or cause reduced ground clearance. The braking system shall be complete with all necessary components and include:	9	Met.
60	Para 3.4.9.1.1	Split apply circuitry. The service brake system shall be designed to employ two separate apply circuits which normally apply simultaneously. The split may be on a wheel by wheel basis (two apply devices per wheel with each device coupled to one of the separate	9	Met.

[a]MIL-T-PD-977, Performance Specification, July 1980.

Note: Underlined portion was not addressed.

Item	Source[a]	Criteria	Applicable Subtest Paragraph	Assessment
		circuits) or on an axle by axle basis (one front and one rear axle per circuit). Each circuit is protected from leaks elsewhere by check valves providing emergency stopping capability. No air will be used directly from the "wet" tank except for the governor pressure signal. Air for all accessories will be taken from one tap on either one of the apply circuit reservoirs and that tap will be provided with a shut off valve.		
61	Para 3.4.9.1.2	Air storage reservoir(s). Capacity shall comply with FMVSS-121 requirements. The tank shall be equipped with a drain valve, safety valve, and check valve between compressor and last reservoir tank.	9	Met.
62	Para 3.4.9.1.3	Foot control - suspended or treadle type.	9	Met.
63	Para 3.4.9.1.4	Air pressure gage for each apply circuit, visible to the driver.	9	Met.
64	Para 3.4.9.1.5	Low air pressure warning buzzer and light.	9	Met.
65	Para 3.4.9.1.7	The wet tank shall be equipped with a drain valve that is readily accessible from the side of the vehicle.	9	Met.
66	Para 3.4.9.1.8	Air control valves.	9	Met.
67	Para 3.4.9.1.9	Dessicant type air dryer system and automatic drain valve(s) shall be provided.	9	Met.

[a]MIL-T-PD-977, Performance Specification, July 1980.

Note: Underlined portion was not addressed.

Item	Source[a]	Criteria	Applicable Subtest Paragraph	Assessment
68	Para 3.4.9.1.10	Provisions for two "glad hands" at both the front and rear of the vehicle to permit a towing vehicle to supply air to the reservoirs on the towed vehicle and to apply the towed vehicles brakes.	9	Met.
69	Para 3.4.10	The manufacturer shall furnish a commercially heavy duty, modified commercial cab, or special designed cab with rear windows to provide the following characteristics. A hard top cab is preferred.	2	Met.
70	Para 3.4.10.1	Two (2) person (minimum capacity).	2	Met.
71	Para 3.4.10.2	Air transportable as part of the vehicle without preparation (preferred) on C130 aircraft. All equipment removed for air transportation must be self storing on the vehicle and not interfere with other loads or normal actions required for movement in and around the transport aircraft.	2	Met.
72	Para 3.4.10.3	Upholstered, individually adjustable driver's seat and passenger seat(s). Seats shall be of the suspension type, adjustable fore and aft and to the occupant's height. The range of adjustments shall be sufficient to accommodate the full percentile range of military drivers.	2	Met.
73	Para 3.4.10.4	Human factors engineered for operator and passenger.		Not evaluated.
74	Para 3.4.10.5	Seat belts, anchors and retractors. FMVSS 208, 209 and 210 compliance.	2	Met.

[a]MIL-T-PD-977, Performance Specification, July 1980.

Note: Underlined portions were not addressed.

Item	Source[a]	Criteria	Applicable Subtest Paragraph	Assessment
75	Para 3.4.10.6	Interior lighting.	2	Met.
76	Para 3.4.10.7	Vehicle cab interior. The vehicle cab interior and upholstery color shall be black, dark green or dark brown. All vehicles produced shall have the same interior color(s). All surfaces, fittings, etc., shall have a low reflectance finish. The cab undercarriage shall be insulated to reduce engine noise and heat. Sunvisors for both driver and passenger shall be provided.	2	Met.
77	Para 3.4.11	Steering. An integral power steering gear shall be furnished. A mechanical connection between steering wheel and front axle steering mechanism must be in effect under all conditions such that if there is a power steering failure the vehicle can be manually steered and brought to a safe stop. Power steering must have 25 micron (or less) filter for this system.	2	Met.
78	Para 3.4.12	Windshield wipers and washers. Vehicle shall be equipped with dual multi-speed windshield wipers and windshield washers. Windshield wipers and washers shall be operated by air (preferred). Washer reservoir with water and appropriate additives for the climatic conditions encountered shall be furnished. Windshield wipers and washers shall conform to FMVSS 104.	2	Met.

[a]MIL-T-PD-977, Performance Specification, July 1980.

Note: Underlined portion was not addressed.

Item	Source[a]	Criteria	Applicable Subtest Paragraph	Assessment
79	Para 3.4.13	Stowage. Stowage space with latching device to utilize a standard padlock will be provided to accommodate air hoses and electrical cables and items listed in paragraph 3.4.13.1 with the exception of the fire extinguisher and first aid kit which will be vehicle mounted.	3	Met.
80	Para 3.4.13.1	Other equipment. Each vehicle will be furnished with the following equipment except for tire chains, which will be furnished with the first two production vehicles only of each type (see paragraph 3.5).	3	Not met. The intervehicular (slave) cable was not provided.
81	Para 3.4.13.1.1	Hydraulic jack, 12 ton with handle for lifting the vehicle axles to exchange mounted tire assembly with properly inflated spare tire assembly.	3	Met.
82	Para 3.4.13.1.2	Wheel-nut lug wrench, with handle for wheel removal and installation.	3	Met.
83	Para 3.4.13.1.3	A fire extinguisher, complying with FMCSR 393.95. The M985 will have an additional dry chemical fire extinguisher with a 10 BC rating mounted externally. Mounting will be installed so that extinguisher is easily accessible to the operator.	3	Met.
84	Para 3.4.13.1.4	Two tire pressure gages, self contained (10 to 120 psi) suitable for checking tire pressures on the tractor, semitrailers, or trailer.	3	Met.

[a]MIL-T-PD-977, Performance Specification, July 1980.

Note: Underlined portion was not addressed.

Item	Source[a]	Criteria	Applicable Subtest Paragraph	Assessment
85	Para 3.4.13.1.5	Two pneumatic hoses, tire inflation, 55 feet long with quick disconnect couplings and necessary fittings, one hookup on each side of the vehicle, to inflate (using the chassis air system) the truck and trailer tires.	3	Met.
86	Para 3.4.13.1.6	Warning device, highway, triangular, reflective, Set of 3, Specification RR-W-1817.	3	Met.
87	Para 3.4.13.1.7	Tools required by operator or crew for performance of operator/crew level maintenance procedures.	3	Met.
88	Para 3.4.13.1.8	First aid kit, general purpose in accordance with FMCSR 393.96, Type B.	3	Met.
89	Para 3.4.13.1.11	Slave cable electrical for slave start from another vehicle. See paragraph 3.4.2.1.	3	Not met. This cable was not provided.
90	Para 3.4.13.1.12	Tire chains for 4 driving wheels. (First two production vehicles of each type only).		Not applicable to this test.
91	Para 3.4.13.1.13	Utility chain, steel alloy, 14 feet long with one grab hook and 2 coupling links with sufficient strength for vehicle recovery.	3	Met.
92	Para 3.4.13.1.14	Four towing shackles per paragraph 3.1.1.3.1.	3	Met.
93	Para 3.4.13.1.15	Four wooden wheel chocks.	3	Met.

[a]MIL-T-PD-977, Performance Specification, July 1980.

Note: Underlined portion was not addressed.

Item	Source[a]	Criteria	Applicable Subtest Paragraph	Assessment
94	Para 3.4.13.1.16	Mounting and/or stowage provisions shall be provided for the following Government furnished equipment (GFE).	3	Met.

NSN	Description	M978
5430-00-158-3807	Padlock w/Chain	2
4720-00-740-9662	Intervehicular Air Hose	1
5340-00-158-3805	Padlock w/o Chain	1
2540-00-670-2459	Pamphlet Bag	1
7510-00-889-3494	Log Book	1
5110-00-293-2336	Axe	1
5120-00-288-6574	Handle - Pick	1
5120-00-243-2395	Pick	1
5120-00-293-3336	Shovel	1
2540-00-409-8891	Bracket - Pioneer Tool	1
5120-00-265-7462	Hammer	1
5975-00-878-3791	Grounding Rods	6

95	Para 3.4.14	Cab heater and defroster. Manufacturer's standard operational fresh air heater and defroster with controls capable of providing adequate heat and window visibility in the temperatures to -25 degrees F <u>at 55 mph road speeds and 15 mph wind speed, and in compliance with FMVSS 103 and SAE J382.</u>	14	Met.

[a]MIL-T-PD-977, Performance Specification, July 1980.

Note: Underlined portion was not addressed.

Item	Source[a]	Criteria	Applicable Subtest Paragraph	Assessment
96	Para 3.4.16	Accessories and equipment. Chassis equipment shall be complete with all accessories furnished as standard commercial equipment by the manufacturer. The following minimum equipment shall be furnished: a. Locking steering column will be required. The mechanism shall be retained in the locked position by a common padlock. b. Voltmeter. c. Fuel gage. d. Engine oil pressure gage with warning device. e. Engine coolant temperature gage with warning device. (Liquid cooled engine). f. Engine cylinder head temperature gage with warning device. (Air cooled engine). g. Speedometer with odometer. h. Tachometer. i. Two air pressure gages (one for each half of the brake system), low air pressure buzzer and warning light.	2	Met.

[a]MIL-T-PD-977, Performance Specification, July 1980.

Item	Source[a]	Criteria	Applicable Subtest Paragraph	Assessment
		j. Standard commercial engine shut down capability.		
		k. Transmission temperature and oil pressure warning devices as recommended by the transmission manufacturer.		
		l. Interior light switch.		
		m. Alternator output gage (ammeter).		
		n. Turn signal light system.		
		o. Emergency flasher system.		
		p. Light switch (MS52128) which controls service lights, blackout drive lights and instrument panel lights.		
		q. Blackout drive lights.		
		r. Glove/map box at least large enough to hold the vehicle log book.		
		s. Ignition switch with an "off", "on", and "start" position manually operated without a key.		
		t. Convenience outlet (24V) with incandescent plug, as a power source for portable electrical equipment.		

[a]MIL-T-PD-977, Performance Specification, July 1980.

Item	Source[a]	Criteria	Applicable Subtest Paragraph	Assessment
97	Para 3.4.17	Rear view mirrors. Large full length (6" x 16") standard heavy duty west coast type outside rearview mirrors (one each side); each with a vibration free (vibration limited to provide readable definition to the truck operator) mounting shall be fixed on each side of the cab. Mirrors shall be capable of being positioned 11 feet apart such that the driver may have clear view of the payloads on the semitrailer. These mirrors shall have a combination of a flat and convex surface enclosed in a common housing. Each shall have at least 50 square inches of flat reflective area and a separate convex 25 inch to 35 inch radius of curvature surface mirror having at least 20 square inches of reflective area. Each mirror assembly shall be capable of folding against the side of the cab and also retract upon impact with brush (FMVSS 111 compliance).	2	Met.
98	Para 3.4.20	Wheel splash and stone throw protection. Splash shields (quarter fenders) ahead of the rear wheels and quick change anti-sail flexible mud flaps shall be installed to the rear of the rear wheels in accordance with normal commercial practice. Mud flap installations at rear wheels shall conform to the rear wheel splash and stone throw protection provisions of SAE J682. Mud flaps shall be installed to prevent mud from the inner axles from being	2	Met.

[a]MIL-T-PD-977, Performance Specification, July 1980.

Note: Underlined portion was not addressed.

Item	Source[a]	Criteria	Applicable Subtest Paragraph	Assessment
		thrown on the mirrors, back of the cab, and into the area between the back of the cab and the truck body. Mud flaps on the tractor shall be mounted to react passively without damage to flaps or semitrailer in a turning situation, and shall also be removable using only onboard hand tools.		
99	Para 3.4.22	Communication equipment. A space allowance and power hookup provisions must be available inside the cab convenient to the driver, for the installation of the AN/VRC-46 radio. Holes will be provided in the cab for the attachment of all items and for passage of cables through metal panels. Holes will be provided in the spare tire carrier for attachment of NSN 5820-00-740-1780 antenna support assembly for mounting of one AS-1729( )/VRC antenna. All cab holes will be filled with removable plugs or threaded fasteners. <u>One Government furnished radio will be installed in a production vehicle to confirm space and accessibility.</u> Subsequent radios will be troop installed.	2	Met.
100	Para 3.5.1.3	Winch. The vehicle shall be equipped with a winch for self-recovery for both forward and rearward deployment. The winch shall be driven by a hydraulic motor mounted directly on the winch. The winch installation shall not decrease vehicle approach or departure angles or the ground clearance of the vehicle. The winch shall provide a minimum line pull of 20,000 lbs from a bare drum with a minimum line	11	Met.

[a]MIL-T-PD-977, Performance Specification, July 1980.

Note: Underlined portion was not addressed.

Item	Source[a]	Criteria	Applicable Subtest Paragraph	Assessment
		speed of 15 ft/min from a bare drum. The winch cable shall be at least 200 feet in length, with a safety factor of 50 percent above maximum line pull capacity. A pressure relief valve shall be provided to limit winch overloading to 110% maximum line pull. End of wire rope will be equipped with a clevis end. Roller or sheave assemblies shall be located at the front and rear of the vehicle to guide the cable. Winch shall be controllable from the driver's position. All controls shall be of the dead man type that will revert to neutral when released. A snatch block shall be provided with this truck to permit using a two part line. Means of securing the snatch block to a tree shall be provided. Stowage provisions for this hardware shall be provided. The winch design shall be in compliance with SAE J706. The maximum continuous rating shall be such that 2 (two) successive 100 ft line pulls can be accomplished at 90 percent of maximum torque necessary to exert a 20,000 lb line pull on bottom layer of cable without exceeding a lube oil temperature of 250 °F or damaging the safety brake at 120 °F ambient. A tension mechanism to assist in level rewind shall be provided.		
101	Para 3.5.2.1	The tanker truck, under standard operating conditions with all basic equipment, will:	4	Not met. See subparagraph d.
		a. Automatic bottom load with self-contained shut-off, from an exterior pump, 600 gpm (2,271 lpm) minimum, utilizing a D-1 type receptacle.		A 600 gpm external pump was not available.

[a]MIL-T-PD-977, Performance Specification, July 1980.

Note: Underlined portions were not addressed.

Item	Source[a]	Criteria	Applicable Subtest Paragraph	Assessment
		b. Automatic bottom load with self-contained shut-off, by a PTO driven pump unfiltered fuel, 300 gpm (1,135 lpm) minimum, see paragraph 3.5.2.4.		Not evaluated.
		c. Bulk unload, by a PTO driven pump, unfiltered fuel, 300 gpm (1,135 lpm) minimum. See paragraph 3.5.2.4.		
		d. Bulk unload, by a PTO driven pump, filtered fuel, 300 gpm (1,135 lpm) diesel, gasoline & jet fuel with a flow control valve. See paragraph 3.5.2.4.	4	Not met. Maximum flow rate attained was 969.0 L/min (256.0 gpm).
		e. Gravity discharge with 4" pipe and hose, unfiltered fuel.	4	Met.
		f. Automotive fuel servicing PTO pump, metered, filtered fuel, w/flow control valve.	4	Met.
		g. Overwing aircraft fuel servicing, PTO pump, metered, filtered fuel, with flow control valve.		Aircraft refueling was not demonstrated.
		h. Aircraft closed circuit refueling, and D-1, PTO pump, metered, filtered fuel, 100 gpm (378 lpm) per hose.		Aircraft refueling was not demonstrated.
		i. Defuel nozzle tube and evacuate hoses with defueling capabilities.	4	Met.

[a]MIL-T-PD-977, Performance Specification, July 1980.

Note: Underlined portions were not addressed.

Item	Source[a]	Criteria	Applicable Subtest Paragraph	Assessment
		j. Recirculate through all lines and hoses, D-1 type receptacle in tank and D-1 type nozzle.	4	Met.
		k. Provide for installation of a vapor recovery kit with 4" camlock adapter IAW MIL-T-45341.	4	Met.
		l. Meet the requirements of NFPA-407 aircraft fuel servicing regulations where possible.		Not evaluated.
		m. Maximum system pressure not to exceed 55 psi.	4	Met.
		n. A gauge stick, 7/8 x 7/8 x 60" hardwood, calibrated in 50 gallon increments on one side and 100 liter increments on the other, with brass ends and a stowage tube will be provided.	4	Met.
102	Para 3.5.2.1.1	The tank shall be stainless steel 304 and shall conform to the current California Air Resources Board (CARB) pressure and vacuum requirements. Carbon steel piping shall not be permitted.		Not evaluated.
103	Para 3.5.2.2	Capacity. The tank truck must have the maximum payload compatible with the chassis capacity (2500 gallons minimum plus 3%) and transportability constraints. It must be capable of towing a M105 series trailer loaded with a pod containing 2,271 liters (600 gallons) of fuel (MOGAS, jet fuel, or diesel). It must also be capable of towing the HEMAT trailer M989 or the M345 trailer under reduced load conditions.	4	Met.

[a]MIL-T-PD-977, Performance Specification, July 1980.

Note: Underlined portions were not addressed.

Item	Source[a]	Criteria	Applicable Subtest Paragraph	Assessment
104	Para 3.5.2.3	The tanker truck will have the capability to carry at least ten 5-gallon (18.9 liters) cans of packaged lubricants, or space for six 50 ft x 2 in. collapsible hoses, three "Y" fittings and one 15 foot section of suction hose to fit the bulk discharge port. The 15-foot hose shall be provided and shall be similar to Army Drawing 11611898 but shall have a pressure rating suitable for the M978 requirements.	4	Met.
105	Para 3.5.2.4	Fuel Servicing Pump. The system shall include a PTO driven pump for automotive gasoline, diesel fuel and jet fuel. The filtered fuel delivery flow rate shall be a nominal 300 gpm with a hydraulic fluid reservoir temperature of 120 ^{o}F and shall be degraded by not more than 10% at a reservoir temperature of 180 ^{o}F with a maximum pressure differential of 10 PSIG across the filter separator, and with 0 PSIG back pressure at the discharge end of the 3 inch x 15 foot suction hose (paragraph 3.5.2.3) connected to the bulk discharge ports.	4	Met.

[a]MIL-T-PD-977, Performance Specification, July 1980.

Item	Source[a]	Criteria	Applicable Subtest Paragraph	Assessment
106	Para 3.5.2.4.1	Emergency Valve. Fuel servicing system shall include an emergency valve assembly which provides the means whereby fuel is not permitted to flow into the plumbing. The control for the emergency valve inside the rear module will automatically be closed when the compartment door is shut. The emergency valve is remotely opened/closed from a point allowing the operator access to the fuel servicing controls. The control shall contain a fusible section causing the valve to close in case of fire. The control shall be positioned on the extreme exterior of the vehicles to allow the operator accessibility during an emergency.	4	Met.
107	Para 3.5.2.4.2	Metering. Fuel servicing shall include a meter which provides the capability of metering filtered fuel flow from any fuel dispensing hose reel.	4	Met.
108	Para 3.5.2.4.3.1	Bottom Loading. Fuel servicing system shall include an automatic bottom loading method capable of accepting 600 gpm (2,271 lpm) from an external pumping source. The automatic bottom loading apparatus shall be adjusted to automatically shut off the flow of fuel into the tank when the fuel in the tank reaches capacity, plus or minus 25 gallons precluding fuel spill. The automatic level sensing device shall be of the fluid jet type.	4	Met.

[a]MIL-T-PD-977, Performance Specification, July 1980.

Note: Underlined portion was not addressed.

Item	Source[a]	Criteria	Applicable Subtest Paragraph	Assessment
109	Para 3.5.2.4.3.2	Top Loading. An opening and covering shall be provided at the top of the tank to allow rapid loading from an externally powered source.	4	Met.
110	Para 3.5.2.4.4	Connectors. Fuel servicing system shall include all necessary couplers, adapters and reducers to insure interoperability with existing fuel dispensing equipment systems and vehicle i.e., Fuel Systems, Supply Point (FSSP), Forward Area Refueling Equipment (FARE) Systems, M49 Series 1,200 gallon tankers, M131 and M857 series 5,000 gallon semitrailer tankers, tank and pumping units.		Compatibility with other refueling systems was not verified.
111	Para 3.5.2.4.5	Hoses and Reels. Fuel servicing system shall include a minimum of two 1-1/2 inch 50-foot (15.2 m) fuel dispensing hoses on hose reels. Each 1-1/2 inch hose shall have a delivery capability of not less than 50 gpm (189 lpm) diesel fuel. Hose ends will be male quick disconnect. Hoses will comply with MIL-H-6615, except for static wire requirements. Two static grounding reels with 40 ft grounding cables and a ten foot long Y branch at the end, with alligator-type end connections on the end of each branch, will be provided.	4	Met.

[a]MIL-T-PD-977, Performance Specification, July 1980.

Note: Underlined portion was not addressed.

Item	Source[a]	Criteria	Applicable Subtest Paragraph	Assessment
112	Para 3.5.2.4.6	Nozzles. Two open port automotive refueling nozzles equipped with female quick disconnect are required. Fuel servicing system shall have the capability of utilizing, on both the 1-1/2 inch hoses, two open port nozzles each with spouts for aircraft servicing & motor vehicle servicing (leaded and unleaded fuel) and the closed-circuit refueling nozzles and "D-1" center point. The nozzles will be equipped with female quick disconnects and be compatible with fuel receiving ports in all fuel consuming equipment or containers.	4	Met.
113	Para 3.5.2.4.7	Filter Separator. The fuel servicing system shall include a filter separator assembly which meets the performance requirements of MIL-F-8901.	4	Met.
114	Para 3.5.2.4.8	Sampling Probe. The vehicle must be equipped with a sampling probe on the discharge side of the filter separator for use with aqua-glow water test kit.	4	Met.
115	Para 3.5.2.4.9	Alternate Fuel Delivery Pump. A 24 volt D.C. powered pump capable of delivering a minimum of 25 gpm (95 lpm) shall be mounted in the delivery manifold and connected to the vehicle electric system. If a hose, otherwise required, is utilized for dispensing from the 24-volt pump, it shall also remain available for other uses as necessary.	4	Met.

[a]MIL-T-PD-977, Performance Specification, July 1980.

Note: Underlined portion was not addressed.

Item	Source[a]	Criteria	Applicable Subtest Paragraph	Assessment
116	Para 3.5.2.4.10	Noise Controls. The maximum noise level during any mode of refueling shall not exceed 85 DBA at 25 meters from the vehicle.	16	Met.
117	Para 3.5.2.4.11	Tank Fuel Level Indicator. The tank must be equipped with a device to visible determine tank fuel level from operator ground level position.	4	Not met. The fuel sensor was inaccurate by as much as 25%.
118	Para 3.5.2.5	Fire Extinguisher. The tanker truck will be equipped with two dry chemical extinguishers with a 20 B rating mounted on the exterior of the truck. Mountings will be installed so that extinguishers are easily accessible to the operator.	3	Met.
119	Para 3.5.2.6	Reliability. The tanker installed system, together with those auxiliary vehicle components which are required for its' operation, shall have a BOC of 150 hours MTBF and a MAV of 75 hours MTBF. Since all system components are required for success, the system reliability is equal to mission reliability.	19	Not met. The demonstrated MTBF was 12.7 hours.
120	Para 3.5.2.7	Maintainability. The Maintenance Ratio (MR) for the Fuel Loading/Dispensing System shall not exceed 0.09. All scheduled and unscheduled maintenance man-hours, excluding operator/crew checks and services, shall be included in this ratio.	18	Not met. The overall MR was 0.187.

[a]MIL-T-PD-977, Performance Specification, July 1980.

Item	Source[a]	Criteria	Applicable Subtest Paragraph	Assessment
121	Para 3.9	Workmanship. Defective components or parts and assemblies which have been repaired or modified to overcome deficiencies shall not be furnished. Welded, bolted and riveted construction utilized shall be in accordance with the standards of the industry. All components used in the assembly of the vehicle shall be new.	2	Not met. The tow pintle fluid passage bolt, V5 butterfly valve, and the bulk tank fuel level sensor were improperly machined, adjusted or calibrated.
122	Test Agency devised, TECOM approved	Repair parts will be authorized in adequate quantities and diversity at the appropriate maintenance levels, consistent with the Maintenance Allocation chart, Repair Parts Special Tools List (RPSTL) and skills required to install and align the parts. Repair parts which are used to maintain the system must be interchangeable with like parts being replaced.	18	Met.
123	Test Agency devised, TECOM approved	The equipment publications contained in the system support package (SSP) will be complete, accurate, easy-to-read, consistent in nomenclature, simple to follow, and adequate to permit completion of both scheduled and unscheduled maintenance operations and parts acquisition at all levels of maintenance. Army equipment publications will conform in content and format to that specified in MIL-M-38784B and MIL-M-63000(TM) series of military specifications as applicable.	18	Met.

[a]MIL-T-PD-977, Performance Specification, July 1980.

Item	Source	Criteria	Applicable Subtest Paragraph	Assessment
124	Test Agency devised, TECOM approved	The support and test equipment outlined in the maintenance literature and/or contained in the system support package will be necessary and adequate for the performance of all required maintenance tasks at all levels of maintenance when used in conjunction with the authorized common tools and test equipment contained in the applicable tool kits. Whenever possible, the design of a system should accommodate the use of common tools rather than special tools. Complicated test equipment requiring frequent calibration and restrictive environmental control conditions should be avoided.	18	Met.
125	Test Agency devised, TECOM approved	Other equipment. Each vehicle will be furnished with the tools required by operator or crew for performance of operator/crew level maintenance procedures.	18	Met.
126	Test Agency devised, TECOM approved	Maintainability. Components of the chassis shall be accessible for servicing, repair, and replacement. Ease of maintenance provisions shall incorporate features insuring operating clearances and facilitate maintenance and service operations. The vehicle design shall incorporate maintainability design principles per AMC Pamphlet 706-134.	18	Not met. The propeller shafts, hydraulic and engine oil filters, and lug nut designs are prejudicial to ease of maintenance.

Item	Source	Criteria	Applicable Subtest Paragraph	Assessment
127	Test Agency devised, TECOM approved	Engine Air Induction System. The engine air induction system shall be furnished complete and installed from the air inlet silencer to the engine assembly intake opening. It shall have the following general characteristics: The induction air ducts shall not require disassembly for normal vehicle maintenance or element servicing.	18	Met.
128	Test Agency devised, TECOM approved	System design will embody features to protect personnel from electrical and mechanical hazards and other dangers that might arise from fire, elevated operating temperatures, toxic fumes, or dangerous environment. System design will, in general, adhere to essential safety principles and standards.	17	Not met. One safety deficiency and seven shortcomings were assessed.
129	Test Agency devised, TECOM approved	The design shall provide work environments which foster effective procedures, work patterns, and personnel safety and health, and which minimize discomfort, distraction and other factors which degrade human performance or increase error. Design shall also be directed toward minimizing personnel and training requirements within the limits of time, cost, and performance trade-off.	17	Not met. One safety deficiency and seven shortcomings were assessed.

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DEFICIENCIES, SHORTCOMINGS, AND SUGGESTED IMPROVEMENTS

1. Deficiencies

Deficiency	Suggested Corrective Action	Remarks
1.1 On grades steeper than 15%, fuel leaked from the overpressure relief valve into the area of the engine compartment (para 5).	Reroute the overflow away from the engine compartment.	Class IIC safety hazard.
1.2 The fuel dispensing system of the M978 was rendered nonoperational during cold chamber testing (para 14).		Failures of the HAV air-line and the V5 valve prevented fuel from being dispensed at low temperatures.
1.3 The 3-inch by 15-foot bulk delivery hose was too stiff at -46 °C (-50 °F) to be of any use during bulk fueling operations (para 14).	Use a material that is more pliable at these temperatures.	
1.4 Failure rate of the ancillary fuel dispensing system was excessive (para 19).		The demonstrated MTBF was 12.7 hours versus a requirement of 75 hours.

2. Shortcomings

Shortcoming	Suggested Corrective Action	Remarks
2.1 The slave cable was not delivered with the vehicle (para 3).	Ensure all BII are shipped with the vehicles.	
2.2 The M978 tanker did not meet all of the fuel flow criteria (para 4).		The bulk unload filtered fuel flow rate was approximately 15% below the stated requirement.
2.3 The bulk tank fuel level sensor was inaccurate (para 4).	Ensure the sensor is properly calibrated prior to delivery.	

Shortcoming	Suggested Corrective Action	Remarks
2.4 The towing pintle would not accept grease due to improper machining of the fluid passage bolt (para 7).	Improve quality control during assembly.	
2.5 Water leaked into the vehicle cab during the fording exercise (para 13).	Improve the door seals and include drainage provisions in the floor.	
2.6 The rubber boot on the ether injection switch became too stiff at -46 °C (-50 °F) to be activated by hand (para 14).	Replace the switch cover with a boot that remains pliable at low temperatures.	
2.7 The V5 butterfly valve would not activate at low temperatures due to improper adjustment during assembly (para 14).	Improve quality control during assembly.	
2.8 Both the permanent and the moveable ladders lacked nonskid surfaces (para 16 and 17).	Apply a nonskid surface, in accordance with MIL-STD-1472C, paragraph 5.7.7.3.	Class IIIC safety hazard.
2.9 Sharp edges exist on the top of the moveable ladder (para 16 and 17).	Round sharp edges, in accordance with MIL-STD-1472C, paragraph 5.13.5.4.	Class IIIC safety hazard.
2.10 Adequate handholds are not provided for climbing the ladder at the rear of the vehicle to access the top fueling port (para 16 and 17).	Incorporate proper handholds, in accordance with MIL-STD-1472C, paragraph 5.7.7.1.3.	Class IIIC safety hazard.
2.11 The travel restraints for the moveable ladder are difficult to use (para 16 and 17).	Redesign the travel restraints so that quick and easy removal is facilitated, in accordance with MIL-HDBK-759A, paragraph 5.2.4.	Class IVA safety hazard.

Shortcoming	Suggested Corrective Action	Remarks
2.12 Radiated emissions from the low-air warning buzzer and horn failed to meet the limits of subtest UMO3 (para 15).	Install in-line filters or capacitors to eliminate the problem.	
2.13 Cooling fan shroud does not encircle the fan blades (para 17).	Provide full fan coverage on future vehicles.	Class IID safety hazard.
2.14 The vehicle battery box height and design require mechanics to lean over the front two batteries to service the rear batteries (para 17).		Class IIIC safety hazard.
2.15 Time required to maintain the fuel loading/dispensing system was excessive (para 18).		Maintenance ratio for the ancillary system was 0.187 versus a requirement of not more than 0.09.
2.16 Design of some components of the M978 are prejudicial to ease of maintenance (para 18).	Redesign the propeller shafts to prevent exposure to dirt during replacement; improve accessibility to the hydraulic and engine oil filters; and redesign so that the front and rear lug nuts are interchangeable.	

3. Corrected Deficiencies and Shortcomings

Corrected Deficiency/ Shortcoming	Suggested Corrective Action	Remarks
3.1 The wheel chock block holder on the left fender interferes with the pioneer tool rack mounting.	Relocate the chock block holder slightly forward on the fender.	The pioneer tool rack and chock blocks were mounted on the vehicle during the initial inspection. No interference was noted.

Corrected Deficiency/ Shortcoming	Suggested Corrective Action	Remarks
3.2 The fuel pressure gauges located in the pump module compartment failed during endurance operations. The lens bezels were coming loose on both the venturi nozzle pressure gauge and the discharge line pressure gauge.	Replace the gauges with a more durable unit.	Replacement gauges were installed on the vehicle per guidance from TACOM, during the initial inspection. These new gauges functioned through the test with no incident.

4. Suggested Improvements

Suggestion	Remarks
4.1 Improve access to the spare tire winch (para 17).	Class IVB safety hazard.

PERFORMANCE TEST DATA

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TABLE 1. LIST OF INSTRUMENTATION

Instrument	Mfr	Model No.	SN	Calibration Date Due	Calibration Period, month
Microphone	B&K	4155	790336	27 Apr 89	12
Microphone	B&K	4155	790369	1 Dec 88	12
Microphone	B&K	4165	1066286	27 Apr 89	12
Microphone	B&K	2642	1015090	2 Oct 88	12
Preamplifier	B&K		1050890	1 Oct 88	12
Microphone	B&K	2810	1057368	20 Aug 88	12
Power supply	B&K		943276	19 Feb 89	12
Pistonphone	B&K	4220	1164880	9 Mar 89	12
Pistonphone	B&K	4230	861582	30 Mar 89	36
Sound level meter	B&K	2209	767752	30 Jan 89	24
Octave filter set	B&K	1613	828969	2 Feb 89	12
Tape recorder	B&K	7006	1061385	[a]CNR	
Digital frequency analyzer	B&K	2131	1046283	[a]CNR	

[a]Calibration not required IAW TB 750-25.

ACOUSTICAL TEST DATA

TIME:	DATE:	TEST ITEM:
0900	4 APRIL 1988	M978 HEMTT TANKER

TEST CONDUCTED BY:	TEST ITEM OPERATOR:	REG./MODEL NO:
D. SCRIBNER	W. BOYD	M978

SERIAL NO.	ODOMETER:	HOUR METER:	TEST ITEM CONDITION:
F6Y	8 mi	15 hr	2/3 MAXIMUM PAYLOAD

TEMPERATURE:	HUMIDITY:	TEST SITE:	SURFACE:
53 Deg. F.	47%	PERRYMAN TEST COURSE	PAVED

TERRAIN:	BAROMETERIC PRESSURE:	SKY COVER:	WIND DIRECTION:
FLAT	1013 mb	CLEAR	318 Deg.

WIND SPEED:	TAPE RECORDER:	OCTAVE ANALYZER:	SOUND LEVEL METER:
9 KNOTS	B&K 7006	B&K 2131	

MICROPHONE:	STATIONARY OPERATION	HIGHWAY DRIVING	DRIVE-BY
B&K 4155	( )	(X)	( )

INTERIOR	EXTERIOR	MICROPHONE LOCATION:
(X)	( )	15 cm RIGHT OF EAR POSITION

****

						OCTAVE BAND CENTER FREQUENCIES (HZ)								
GEAR	RPM	SPEED KM/HR	dBA	dBB	dBC	ALL PASS	31.5	63	125	250	500	1000	2000	4000	8000
WINDOWS OPEN, FAN OFF															
						PASSENGER									
N	IDLE	0	71	81	90	92	84	90	76	64	65	68	62	54	55
1	700	8	72	80	88	91	87	85	77	72	66	68	61	55	56
1	1200	16	79	88	97	100	98	88	90	77	73	73	69	63	64
2	1400	24	76	87	96	104	95	94	83	73	71	72	66	61	64
2	1600	32	74	82	92	101	93	87	81	72	69	69	64	60	64
3	1400	40	75	83	93	104	95	88	80	74	73	69	64	59	61
3	1500	48	79	91	100	107	101	94	92	77	70	69	65	63	66
D	1300	56	81	91	102	110	103	95	90	81	75	75	70	69	74
D	1500	64	82	93	101	105	102	91	95	81	74	74	70	63	65
D	1600	72	84	95	103	107	104	94	97*	82	76	74	70	64	65
D	1700	80	88*	99	106	110	107	97	101*	90*	80	76	75	70	74
D	1800	88	88*	98	106	112	107	97	100*	90*	84*	79	75	71	74
						MAXIMUM ALLOWABLE LIMITS OF MIL-STD-1474B(MI), TABLE 2, CATEGORY D									
			<85				106	96	89	83	80	79	79	81	

*LEVELS EXCEEDING MAXIMUM ALLOWABLE LIMITS OF CATEGORY D

ACOUSTICAL TEST DATA

TIME:	DATE:	TEST ITEM:
0900	4 APRIL 1988	M978 HEMTT TANKER

TEST CONDUCTED BY:	TEST ITEM OPERATOR:	REG./MODEL NO:
D. SCRIBNER	W. BOYD	M978

SERIAL NO.	ODOMETER:	HOUR METER:	TEST ITEM CONDITION:
F6Y	8 mi	15 hr	2/3 MAXIMUM PAYLOAD

TEMPERATURE:	HUMIDITY:	TEST SITE:	SURFACE:
53 Deg. F.	47%	PERRYMAN TEST COURSE	PAVED

TERRAIN:	BAROMETERIC PRESSURE:	SKY COVER:	WIND DIRECTION:
FLAT	1013 mb	CLEAR	318 Deg.

WIND SPEED:	TAPE RECORDER:	OCTAVE ANALYZER:	SOUND LEVEL METER:
9 KNOTS	B&K 7006	B&K 2131	

MICROPHONE:	STATIONARY OPERATION	HIGHWAY DRIVING	DRIVE-BY
B&K 4155	( )	(X)	( )

INTERIOR	EXTERIOR	MICROPHONE LOCATION:
(X)	( )	15 cm RIGHT OF EAR POSITION

****

						OCTAVE BAND CENTER FREQUENCIES (HZ)									
GEAR	RPM	SPEED KM/HR	dBA	dBB	dBC	ALL PASS	31.5	63	125	250	500	1000	2000	4000	8000
WINDOWS CLOSED, FAN OFF															
PASSENGER															
N	IDLE	0	67	79	87	89	78	87	72	66	59	61	55	54	56
1	700	8	69	80	89	99	88	88	73	65	61	63	58	59	64
1	1200	16	72	84	95	99	98	84	83	69	63	65	61	58	60
2	1400	24	74	88	96	98	86	96	83	70	65	66	60	59	64
2	1600	32	72	82	91	98	91	88	82	71	65	66	61	59	64
3	1400	40	73	82	91	100	92	87	82	72	68	67	61	59	64
3	1500	48	75	86	93	100	91	90	88	73	67	67	61	59	64
D	1300	56	78	88	95	103	94	90	90	77	73	70	65	60	64
D	1500	64	79	86	94	103	94	89	86	75	79	72	64	61	64
D	1600	72	80	90	98	105	97	93	92	79	74	73	67	61	65
D	1700	80	81	91	99	104	99	94	93	84	74	70	66	61	65
D	1800	88	80	90	98	106	98	93	89	84	76	72	66	62	65
MAXIMUM ALLOWABLE LIMITS OF MIL-STD-1474B(MI), TABLE 2, CATEGORY D															
			<85					106	96	89	83	80	79	79	81

ACOUSTICAL TEST DATA

TIME:	DATE:	TEST ITEM:
0900	4 APRIL 1988	M978 HEMTT TANKER

TEST CONDUCTED BY:	TEST ITEM OPERATOR:	REG./MODEL NO:
D. SCRIBNER	W. BOYD	M978

SERIAL NO.	ODOMETER:	HOUR METER:	TEST ITEM CONDITION:
F6Y	8 mi	15 hr	2/3 MAXIMUM PAYLOAD

TEMPERATURE:	HUMIDITY:	TEST SITE:	SURFACE:
53 Deg. F.	47%	PERRYMAN TEST COURSE	PAVED

TERRAIN:	BAROMETERIC PRESSURE:	SKY COVER:	WIND DIRECTION:
FLAT	1013 mb	CLEAR	318 Deg.

WIND SPEED:	TAPE RECORDER:	OCTAVE ANALYZER:	SOUND LEVEL METER:
9 KNOTS	B&K 7006	B&K 2131	

MICROPHONE:	STATIONARY OPERATION	HIGHWAY DRIVING	DRIVE-BY
B&K 4155	( )	(X)	( )

INTERIOR	EXTERIOR	MICROPHONE LOCATION:
(X)	( )	15 cm RIGHT OF EAR POSITION

****

						OCTAVE BAND CENTER FREQUENCIES (HZ)								
GEAR	RPM	SPEED KM/HR	dBA	dBB	dBC	ALL PASS	31.5	63	125	250	500	1000	2000	4000	8000
WINDOWS CLOSED, FAN ON HIGH															
PASSENGER															
	IDLE	0	78	84	90	92	85	88	82	75	79	71	63	57	57
1	700	8	80	87	97	101	99	86	86	75	80	74	66	62	65
1	1200	16	79	87	96	101	98	86	87	76	79	73	64	60	60
2	1400	24	80	87	94	99	90	92	87	77	79	74	65	62	65
2	1600	32	79	86	92	99	90	88	85	77	79	73	65	62	65
3	1400	40	82	86	91	102	91	86	84	77	83	75	66	62	65
3	1500	48	80	86	93	103	93	87	87	76	80	75	66	63	65
D	1300	56	80	85	92	102	91	86	84	76	80	74	66	62	65
D	1500	64	81	88	94	105	94	89	89	77	81	75	67	63	66
D	1600	72	82	90	97	107	96	92	90	78	83	74	68	64	66
D	1700	80	84	94	100	109	99	93	97*	84	77	74	67	64	66
D	1800	88	90*	100	107	115	106	99	103*	89	86*	82*	76	72	75
MAXIMUM ALLOWABLE LIMITS OF MIL-STD-1474B(MI), TABLE 2, CATEGORY D															
			<85				106	96	89	83	80	79	79	81	

*LEVELS EXCEEDING MAXIMUM ALLOWABLE LIMITS OF CATEGORY D

ACOUSTICAL TEST DATA

TIME:	DATE:	TEST ITEM:
0900	4 APRIL 1988	M978 HEMTT TANKER

TEST CONDUCTED BY:	TEST ITEM OPERATOR:	REG./MODEL NO:
D. SCRIBNER	W. BOYD	M978

SERIAL NO.	ODOMETER:	HOUR METER:	TEST ITEM CONDITION:
F6Y	8 mi	15 hr	2/3 MAXIMUM PAYLOAD

TEMPERATURE:	HUMIDITY:	TEST SITE:	SURFACE:
53 Deg. F.	47%	PERRYMAN TEST COURSE	PAVED

TERRAIN:	BAROMETERIC PRESSURE:	SKY COVER:	WIND DIRECTION:
FLAT	1013 mb	CLEAR	318 Deg.

WIND SPEED:	TAPE RECORDER:	OCTAVE ANALYZER:	SOUND LEVEL METER:
9 KNOTS	B&K 7006	B&K 2131	

MICROPHONE:	STATIONARY OPERATION	HIGHWAY DRIVING	DRIVE-BY
B&K 4155	( )	(X)	( )

INTERIOR	EXTERIOR	MICROPHONE LOCATION:
(X)	( )	15 cm RIGHT OF EAR POSITION

****

						OCTAVE BAND CENTER FREQUENCIES (HZ)									
GEAR	RPM	SPEED KM/HR	dBA	dBB	dBC	ALL PASS	31.5	63	125	250	500	1000	2000	4000	8000
						WINDOWS OPEN, FAN OFF									
						DRIVER									
N	IDLE	0	70	78	86	88	79	85	77	65	64	65	62	56	57
1	700	8	71	78	85	88	83	82	80	66	64	67	61	56	57
1	1200	16	81	89	99	102	102	86	87	79	77	77	72	67	66
2	1400	24	77	86	93	95	87	93	84	75	70	71	68	64	66
2	1600	32	74	81	88	90	86	83	82	71	67	70	66	62	66
3	1400	40	73	79	88	91	88	83	78	72	67	68	63	62	67
3	1500	48	80	90	95	97	92	85	93	78	71	72	68	65	66
D	1300	56	79	87	94	96	93	86	90	79	72	73	68	64	66
D	1500	64	82	92	100	103	100	91	94	83	74	73	70	67	68
D	1600	72	83	93	101	103	101	92	96	84	75	73	71	68	68
D	1700	80	89*	99	105	107	103	95	102*	89	80	77	74	74	76
D	1800	88	88*	97	103	105	102	92	101*	88	80	77	74	73	75
						MAXIMUM ALLOWABLE LIMITS OF MIL-STD-1474B(MI), TABLE 2, CATEGORY D									
			<85				106	96	89	83	80	79	79	81	

*LEVELS EXCEEDING MAXIMUM ALLOWABLE LIMITS OF CATEGORY D

ACOUSTICAL TEST DATA

TIME:	DATE:	TEST ITEM:
0900	4 APRIL 1988	M978 HEMTT TANKER

TEST CONDUCTED BY:	TEST ITEM OPERATOR:	REG./MODEL NO:
D. SCRIBNER	W. BOYD	M978

SERIAL NO.	ODOMETER:	HOUR METER:	TEST ITEM CONDITION:
F6Y	8 mi	15 hr	2/3 MAXIMUM PAYLOAD

TEMPERATURE:	HUMIDITY:	TEST SITE:	SURFACE:
53 Deg. F.	47%	PERRYMAN TEST COURSE	PAVED

TERRAIN:	BAROMETERIC PRESSURE:	SKY COVER:	WIND DIRECTION:
FLAT	1013 mb	CLEAR	318 Deg.

WIND SPEED:	TAPE RECORDER:	OCTAVE ANALYZER:	SOUND LEVEL METER:
9 KNOTS	B&K 7006	B&K 2131	

MICROPHONE:	STATIONARY OPERATION	HIGHWAY DRIVING	DRIVE-BY
B&K 4155	( )	(X)	( )

INTERIOR	EXTERIOR	MICROPHONE LOCATION:
(X)	( )	15 cm RIGHT OF EAR POSITION

****

							OCTAVE BAND CENTER FREQUENCIES (HZ)							
GEAR	RPM	SPEED KM/HR	dBA	dBB	dBC	ALL PASS	31.5	63	125	250	500	1000	2000	4000	8000

WINDOWS CLOSED, FAN OFF

DRIVER

N	IDLE	0	67	76	83	85	75	83	70	69	63	60	57	54	56
1	700	8	66	73	81	89	82	78	70	63	61	61	57	55	57
1	1200	16	71	82	93	96	96	80	82	69	68	64	61	57	56
2	1400	24	71	80	88	91	88	86	80	70	68	65	61	56	58
2	1600	32	71	79	86	90	86	81	80	71	67	65	60	55	57
3	1400	40	71	79	87	92	87	80	81	72	67	65	61	57	58
3	1500	48	73	82	89	93	89	81	84	76	70	65	61	56	58
D	1300	56	78	89	94	97	92	82	93	78	71	68	64	58	59
D	1500	64	75	83	91	95	92	83	83	77	73	67	63	59	59
D	1600	72	80	90	96	98	93	85	94	79	71	67	65	59	59
D	1700	80	80	91	96	99	94	86	94	80	73	67	66	60	59
D	1800	88	79	87	95	99	96	87	87	83	76	68	66	62	60

MAXIMUM ALLOWABLE LIMITS OF MIL-STD-1474B(MI), TABLE 2 CATEGORY D

		<85					106	96	89	83	80	79	79	81	

ACOUSTICAL TEST DATA

TIME:	DATE:	TEST ITEM:
0900	4 APRIL 1988	M978 HEMTT TANKER

TEST CONDUCTED BY:	TEST ITEM OPERATOR:	REG./MODEL NO:
D. SCRIBNER	W. BOYD	M978

SERIAL NO.	ODOMETER:	HOUR METER:	TEST ITEM CONDITION:
F6Y	8 mi	15 hr	2/3 MAXIMUM PAYLOAD

TEMPERATURE:	HUMIDITY:	TEST SITE:	SURFACE:
53 Deg. F.	47%	PERRYMAN TEST COURSE	PAVED

TERRAIN:	BAROMETERIC PRESSURE:	SKY COVER:	WIND DIRECTION:
FLAT	1013 mb	CLEAR	318 Deg.

WIND SPEED:	TAPE RECORDER:	OCTAVE ANALYZER:	SOUND LEVEL METER:
9 KNOTS	B&K 7006	B&K 2131	

MICROPHONE:	STATIONARY OPERATION	HIGHWAY DRIVING	DRIVE-BY
B&K 4155	( )	(X)	( )

INTERIOR	EXTERIOR	MICROPHONE LOCATION:
(X)	( )	15 cm RIGHT OF EAR POSITION

****

							OCTAVE BAND CENTER FREQUENCIES (HZ)								
GEAR	RPM	SPEED KM/HR	dBA	dBB	dBC	ALL PASS	31.5	63	125	250	500	1000	2000	4000	8000

WINDOWS CLOSED, FAN ON HIGH

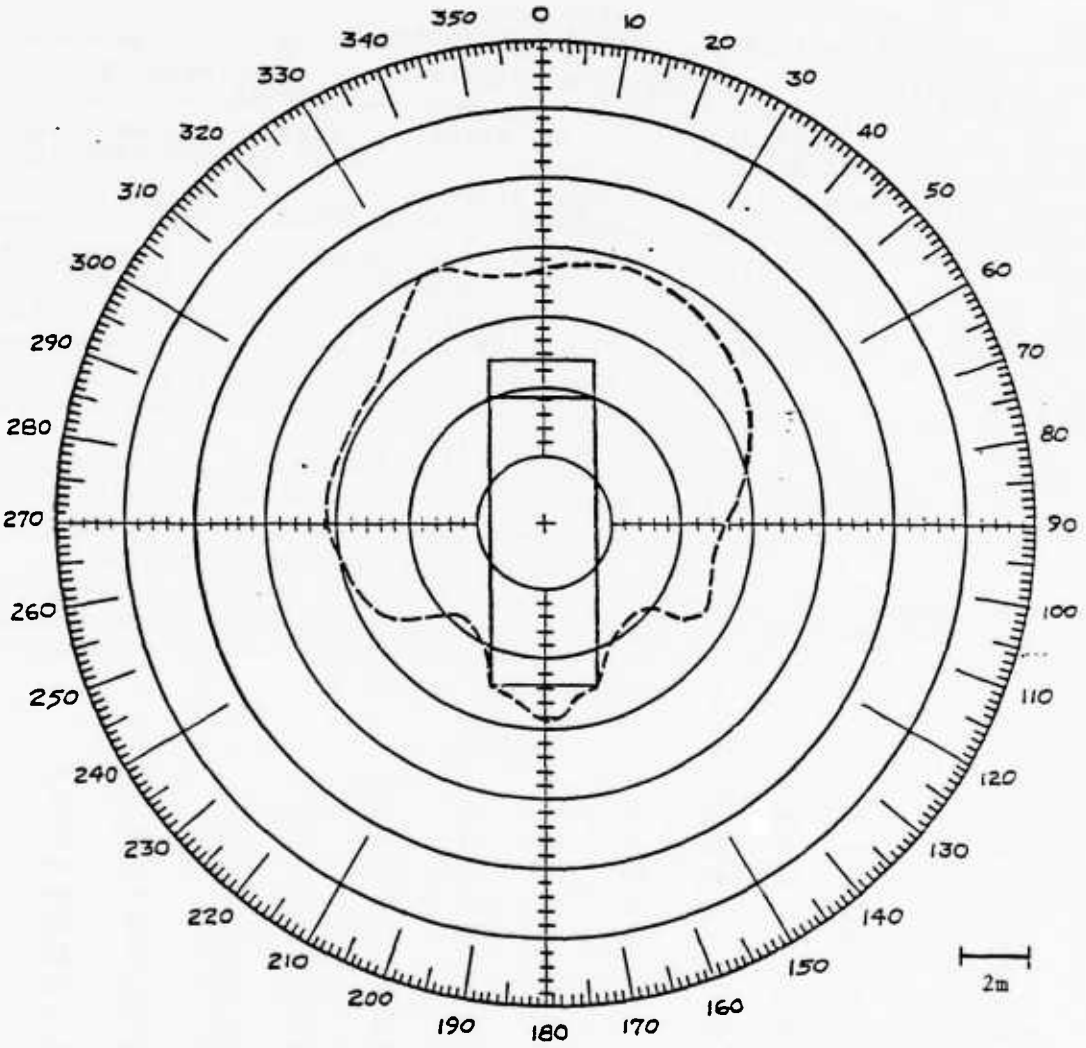
DRIVER

N	IDLE	0	79	83	88	91	82	86	80	77	75	70	69	65	67
1	700	8	78	85	94	98	96	82	83	78	77	72	64	59	58
1	1200	16	76	81	85	91	84	78	79	78	76	71	62	57	58
2	1400	24	79	85	94	97	96	79	85	76	79	73	65	59	58
2	1600	32	78	83	88	92	87	82	81	78	77	73	64	59	58
3	1400	40	78	83	88	93	87	83	81	78	78	73	65	59	57
3	1500	48	79	87	93	97	92	81	90	78	78	73	66	59	59
D	1300	56	81	86	91	97	92	83	84	80	80	77	69	63	59
D	1500	64	78	84	92	97	93	82	83	78	77	73	65	59	59
D	1600	72	80	88	95	100	96	86	91	79	78	74	67	61	60
D	1700	80	83	93	98	101	96	85	96	81	79	74	68	61	60
D	1800	88	91*	98	106	109	106	97	99*	92*	88*	85*	78	75	71

MAXIMUM ALLOWABLE LIMITS OF MIL-STD-1474B(MI), TABLE 2, CATEGORY D

		<85				106	96	89	83	80	79	79	81		

*DENOTES EXCEEDING MAXIMUM ALLOWABLE LIMITS OF CATEGORY D



TEST ITEM: M978 HEMTT Tanker	DATE: 23 May 1988
High Idle - Recirculating Fuel	TESTER: D. Scribner

Figure 1. Noise contour (85 dB(A)) of the M978 HEMTT.

DATA SHEET For use of this form, see EET Pro 70-1; the proponent is Engineering Test Br	Name of Test Item: CPT OF HEMTT, M978 TANKER	Test Date(s): MAY 1988
	Subtest Title: LOW TEMPERATURE TEST	Name of Person Recording Data: D. PHIPPS

ENGINE START DATA			
MONTH / DAY	5/6	5/9	5/14
TIME	1155	0930	0930
NOMINAL TEST TEMP, °F	-25	-25	-50
TEMPS BEFORE START			
CHAMBER AMBIENT	-25	-24	-49
ENGINE OIL SUMP	-24	-26	-47
TRANS OIL SUMP	-26	-25	-50
COOLANT	-24	-23	+50
FUEL	-24	-25	-48
BATTERY ELECTROLYTE	-23	-24	-44
			**
START NO.	1	2	3
TIME TO FIRST FIRE - SEC	4.5	6.5	
TOTAL NO. OF CRANKS REQUIRED	4	5	4
* TIME TO START - SEC	__ __	55	DNS
BATTERY VOLTAGE			
BEFORE CRANKING	25.2	25.1	24.0
AVG. WHILE CRANKING	16.7	17.2	15.5

* THREE SHOT ETHER INJECTION PROCEDURE USED

** AFTER 45 MINUTE ENGINE PREHEAT

DATA SHEET For use of this form, see EET Pro 70-1; the proponent is Engineering Test Br	Name of Test Item: CPT OF HEMTT, M978 TANKER	Test Date(s): MAY 1988
	Subtest Title: LOW TEMPERATURE TEST	Name of Person Recording Data: D. PHIPPS

PERSONNEL HEATER TEST AT -25°F																
MONTH / DAY	5/6															
NOMINAL TEST TEMP °F	-25															
TIME	1411	1421	1431	1441	1451											
ELAPSED TIME, MIN	0	10	20	30	40											
TEMPERATURES °F																
CHAMBER AMBIENT	-28	-26	-24	-23	-24											
COOLANT	144	163	175	176	176											
PERSONNEL HTR OUTLET -LEFT	-26	83	100	107	110											
PERSONNEL HTR OUTLET- RIGHT	-23	94	111	118	121											
AIR AT DRIVERS HEAD	-25	35	52	62	67											
AIR AT DRIVERS FEET	-27	27	43	52	58											
AIR AT PASS. HEAD	-22	43	61	72	78											
AIR AT PASS. FEET	-24	30	49	60	67											
AIR AT CENTER OF CAB.	-25	31	49	58	64											
	*															
* ENGINE WARMED FOR 15 MINUTES PRIOR TO STARTING HEATER TEST. TEST CONDUCTED WITH ENGINE AT HI IDLE.																

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STEAP-MT Form 234, 1 Aug 75 Edition of 11 Apr 72 may be used.

DATA SHEET For use of this form, see EET Pro 70-1; the proponent is Engineering Test Br	Name of Test Item: CPT OF HEMTT, M978 TANKER							Test Date(s): MAY 1988						
	Subtest Title: LOW TEMPERATURE TEST							Name of Person Recording Data: D. PHIPPS						
WINDSHIELD DEFROSTER TEST AT -25°F														
MONTH / DAY	5/9													
NOMINAL TEST TEMP, °F	-25													
TIME	1413	1423	1433	1443	1453	1503	1513							
ELAPED TIME, MIN	0	10	20	30	40	50	60							
TEMPERATURES OF														
CHAMBER AMBIENT	-26	-23	-23	-22	-23	-24	-23							
COOLANT	89	136	160	172	176	176	176							
DEFROSTER OUTLET - LEFT	-21	75	101	116	120	127	129							
DEFROSTER OUTLET - RIGHT	-23	79	105	121	125	132	133							
AIR AT CENTER OF CAB	-24	22	42	55	63	68	71							
	*													
% OF WINDSHIELD CLEAR	0		20		60		80							

* ENGINE WARMED 15 MINUTES PRIOR TO STARTING DEFROSTER TEST. TEST CONDUCTED WITH ENGINE AT HI IDLE

STEAP-MT Form 234, 1 Aug 75 Edition of 11 Apr 72 may be used.

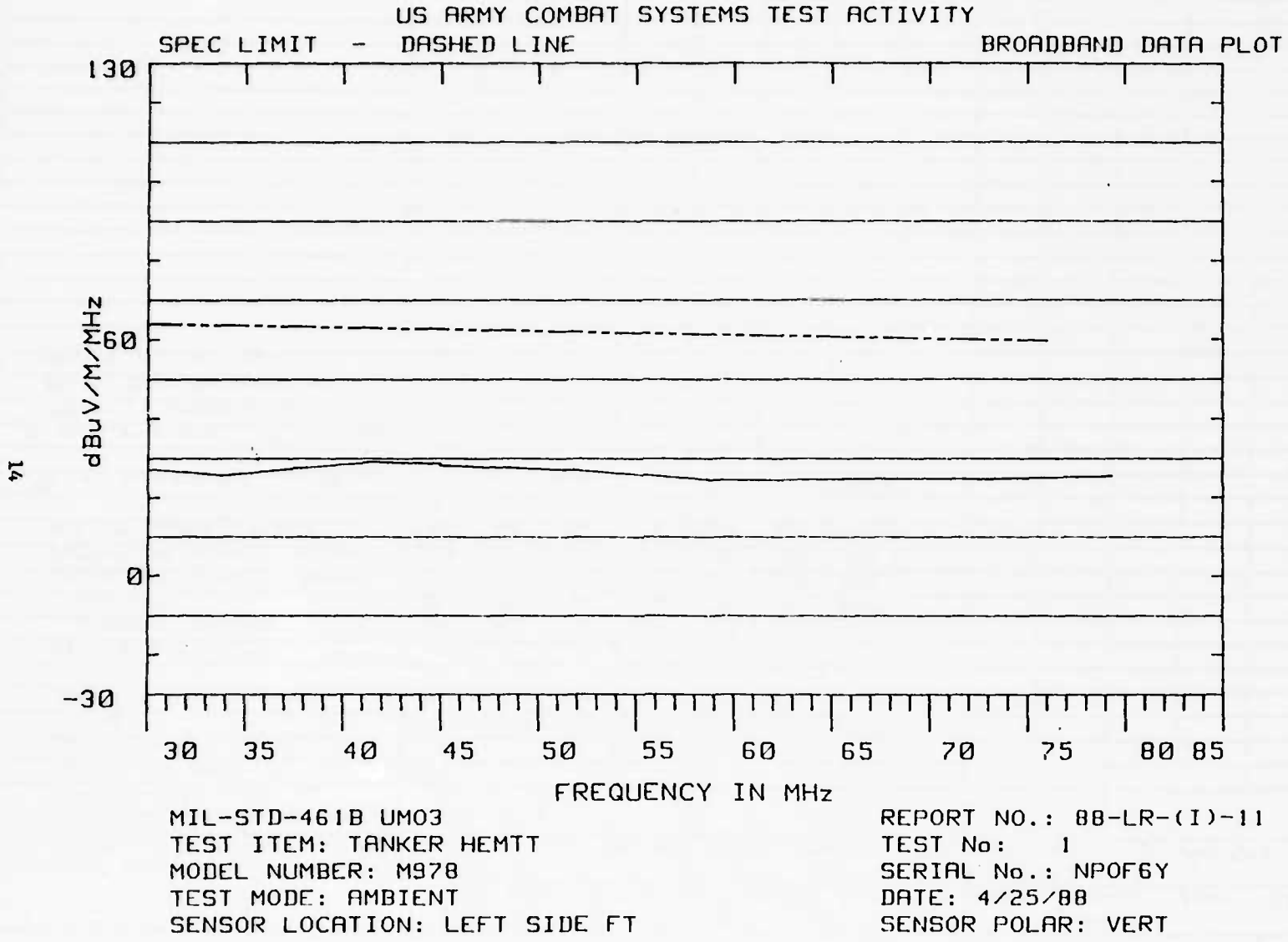

Figure 2. Radiated emissions.

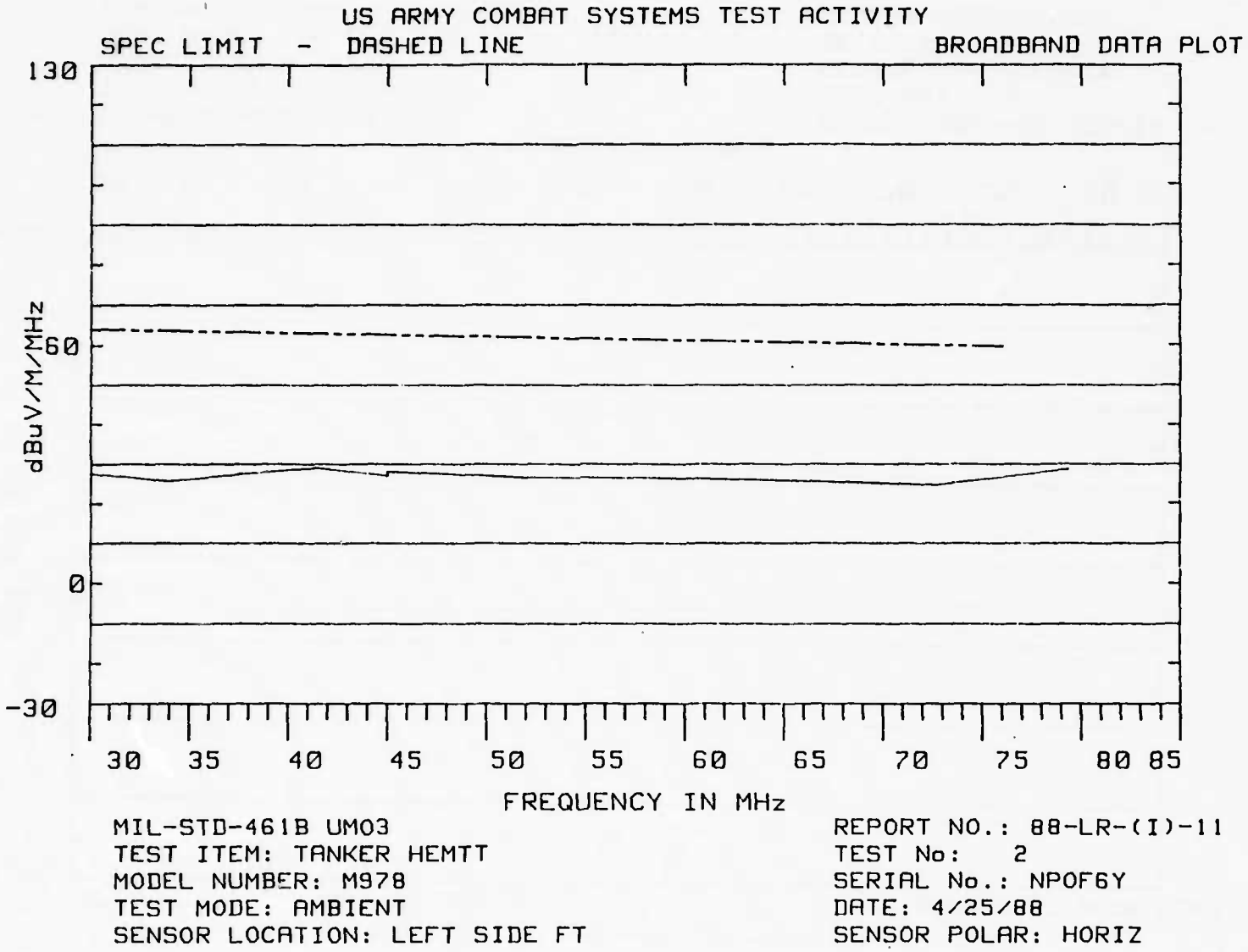

Figure 3. Radiated emissions.

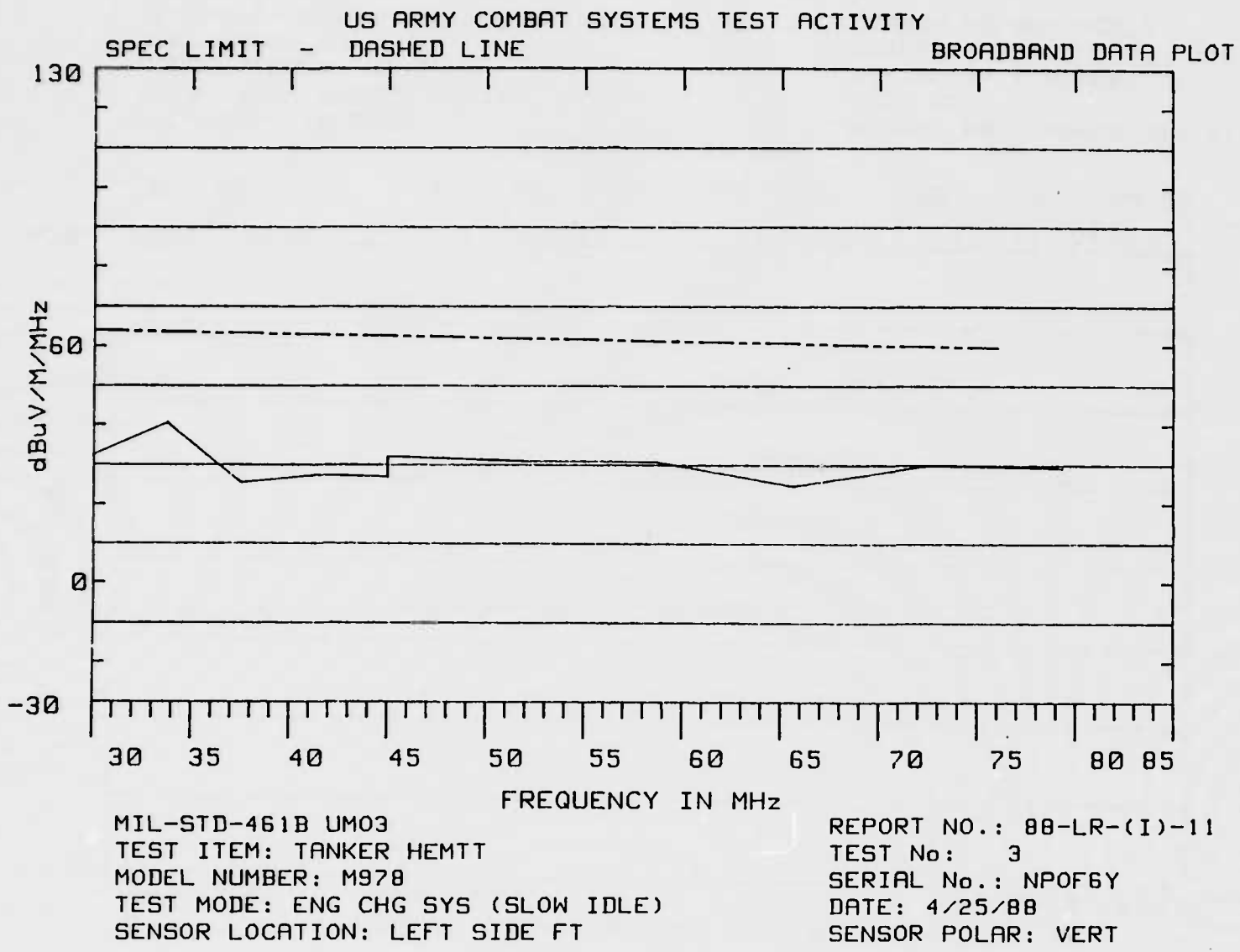

Figure 4. Radiated emissions.

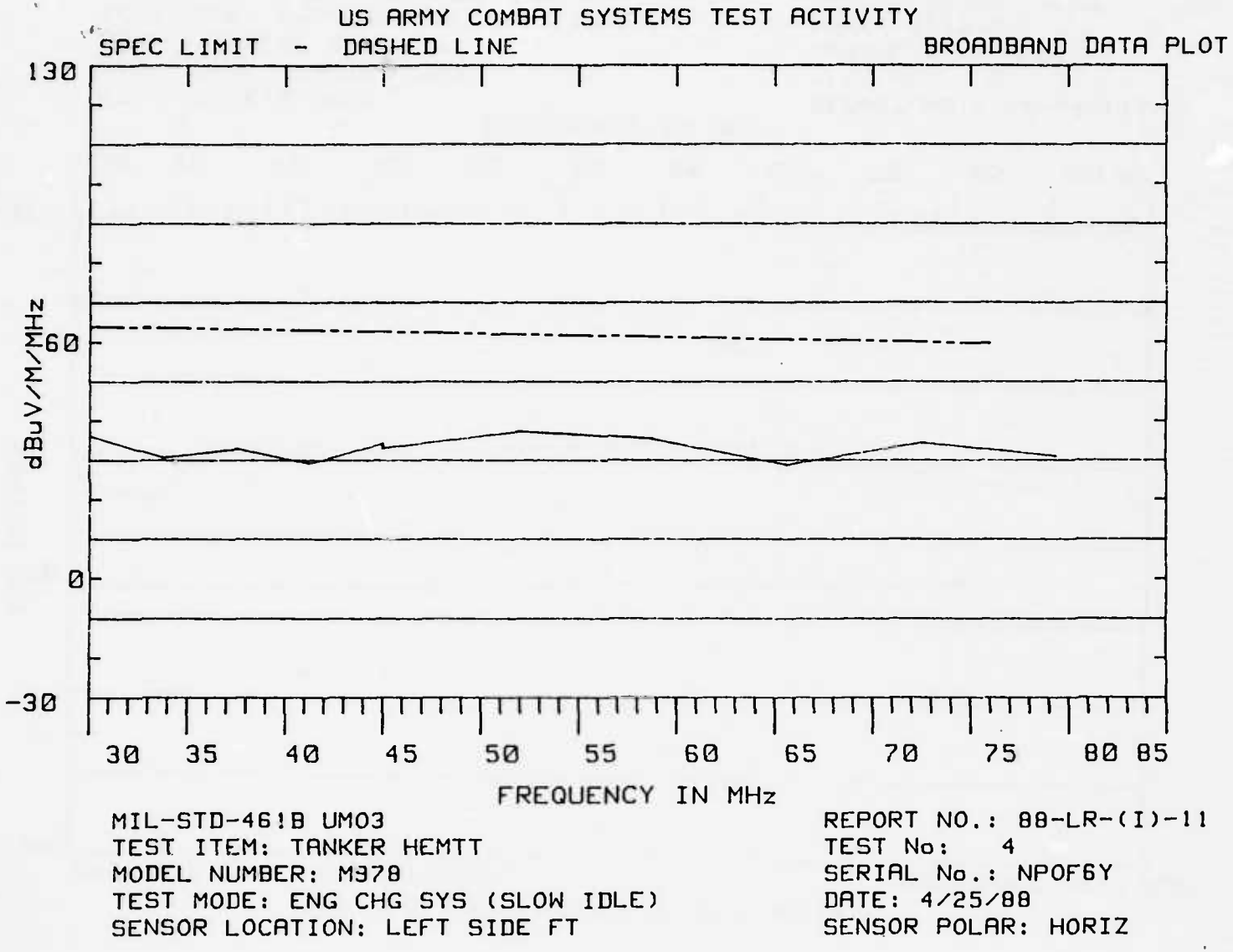

Figure 5. Radiated emissions.

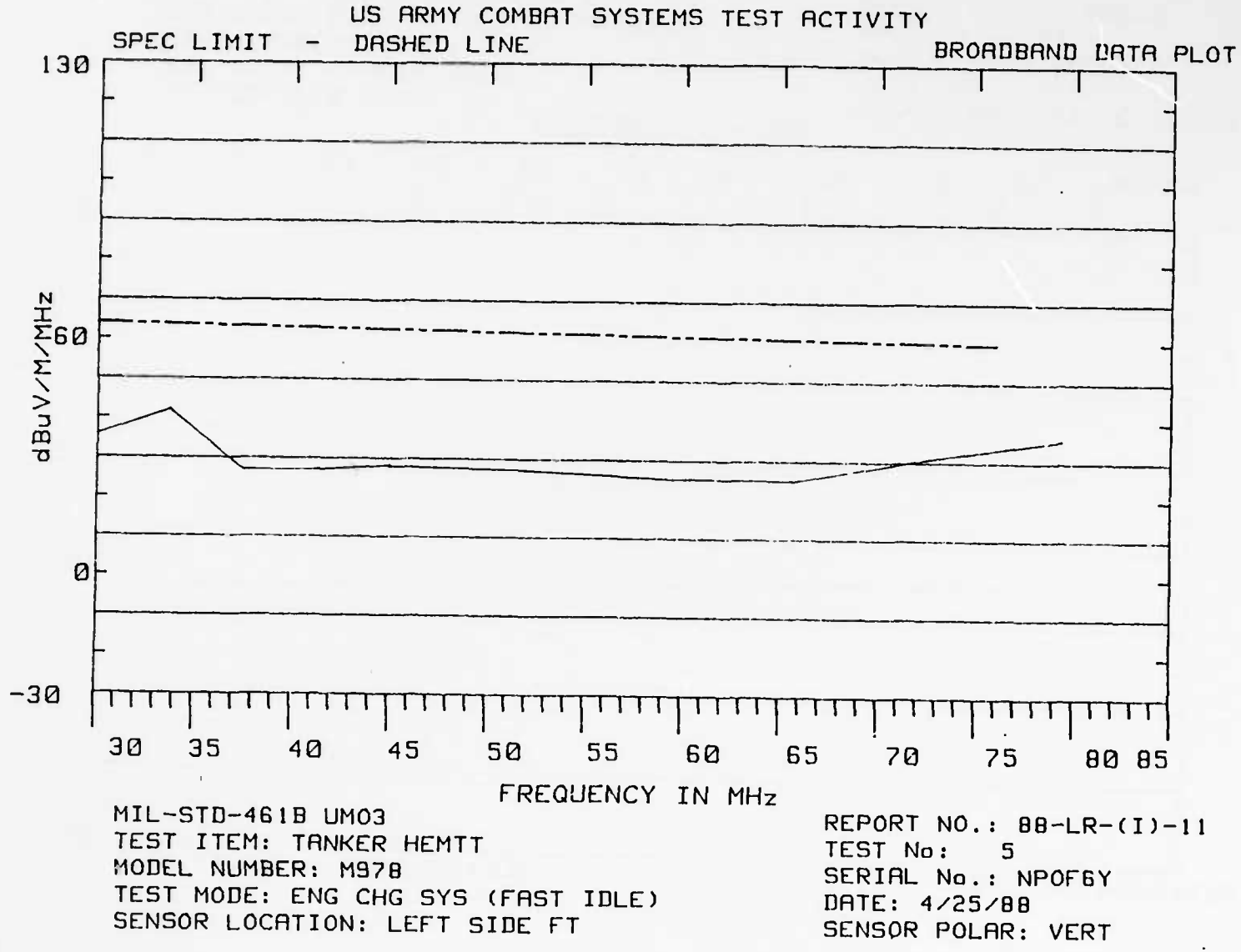

Figure 6. Radiated emissions.

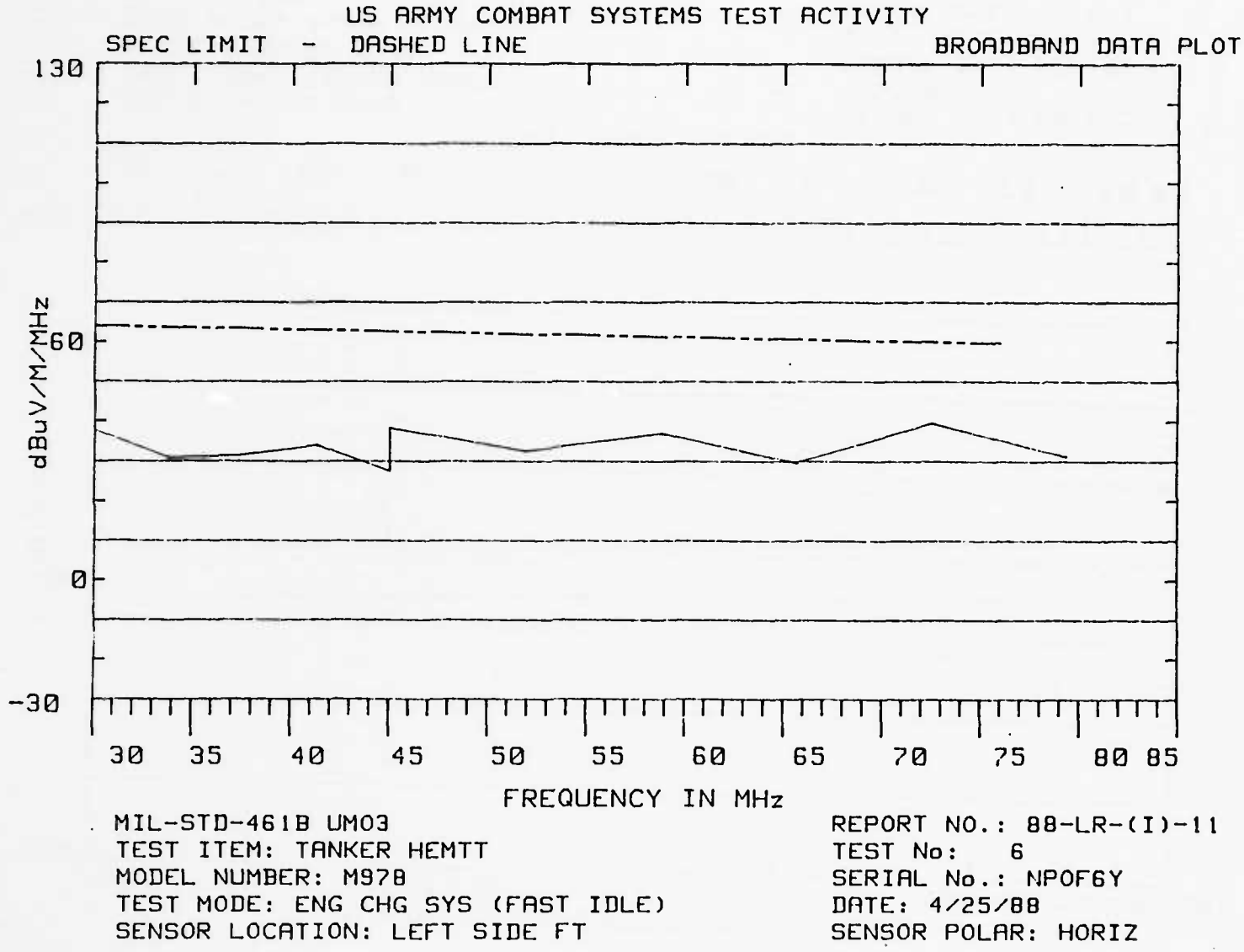

Figure 7. Radiated emissions.

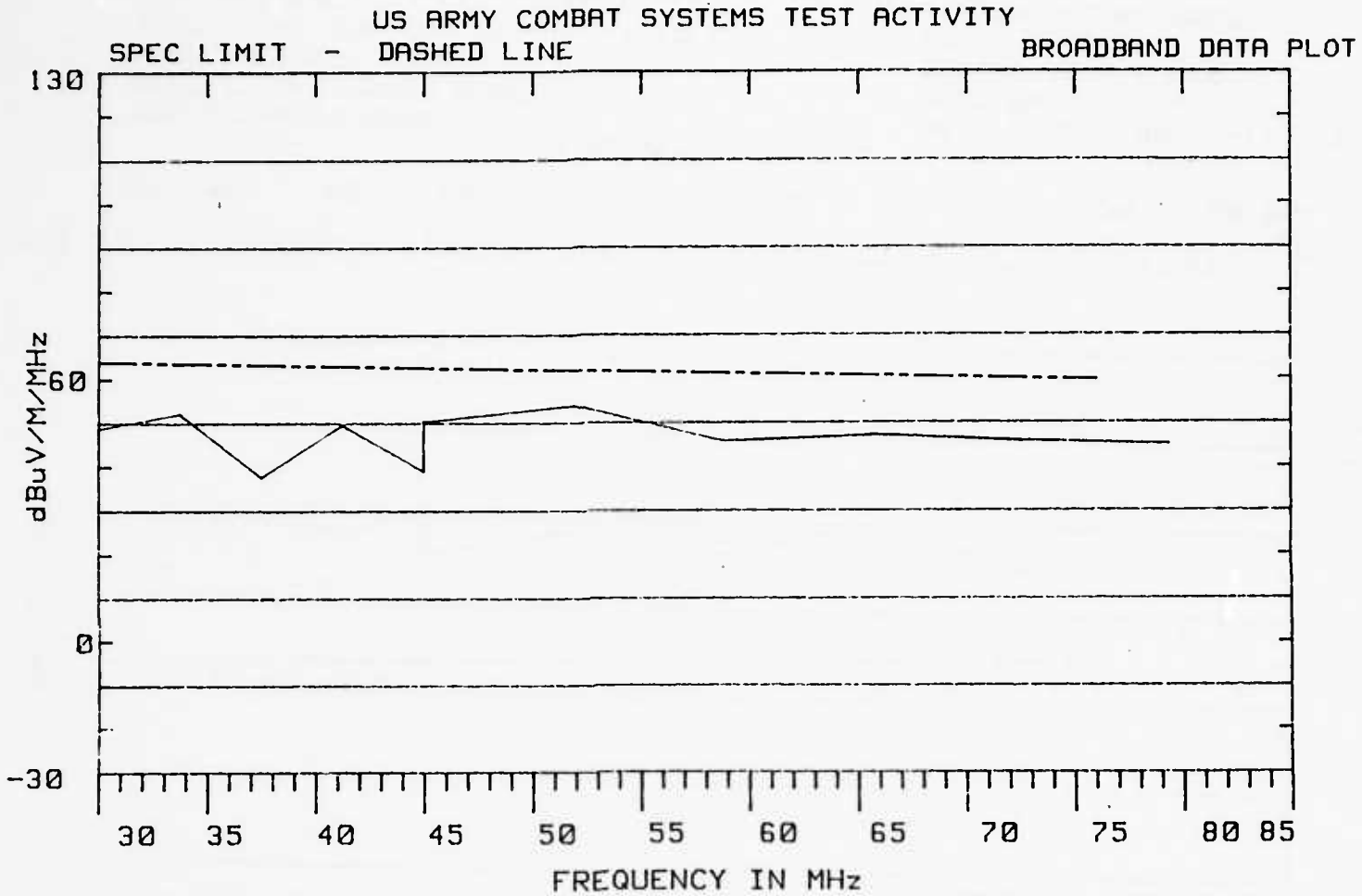

Figure 8. Radiated emissions.

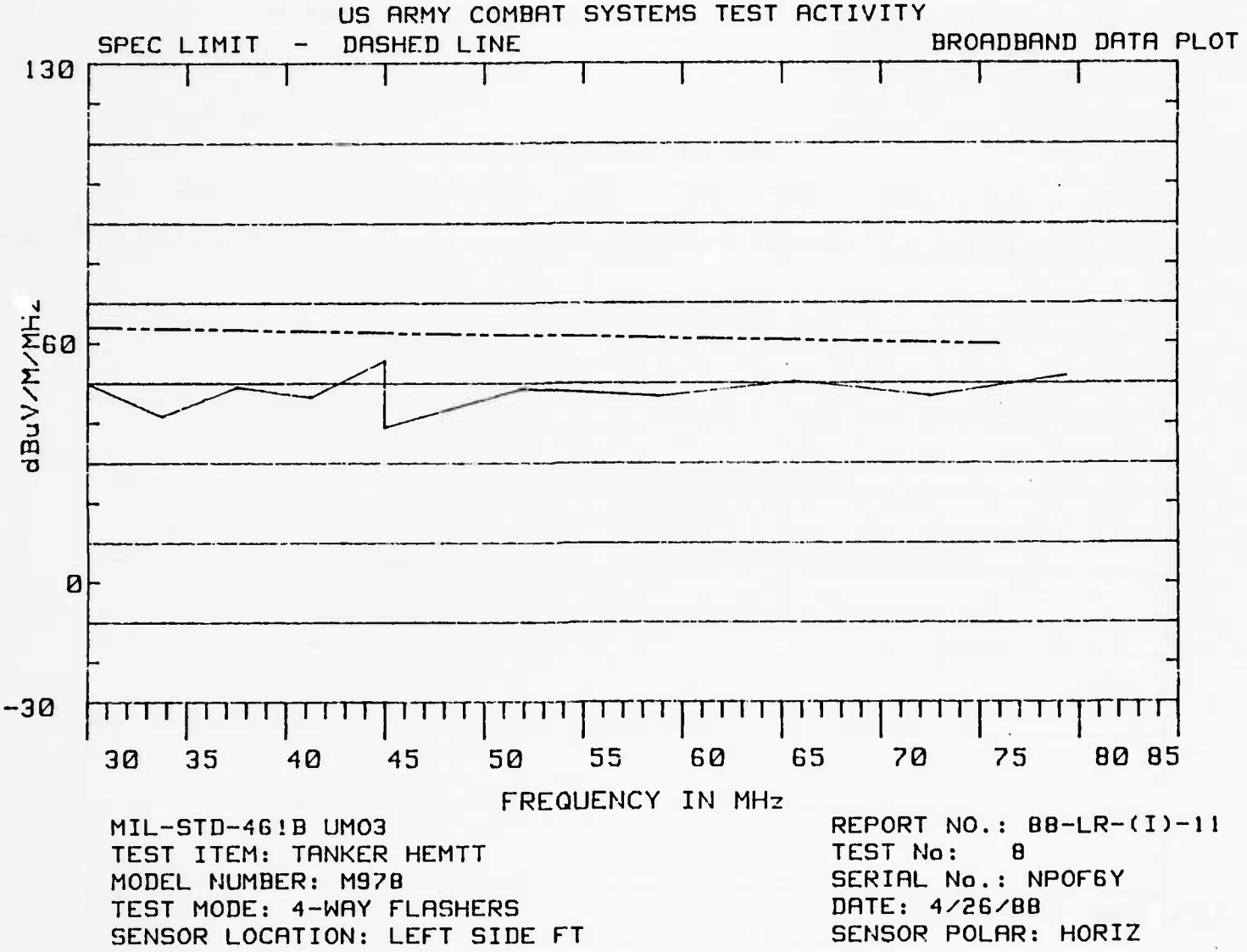

Figure 9. Radiated emissions.

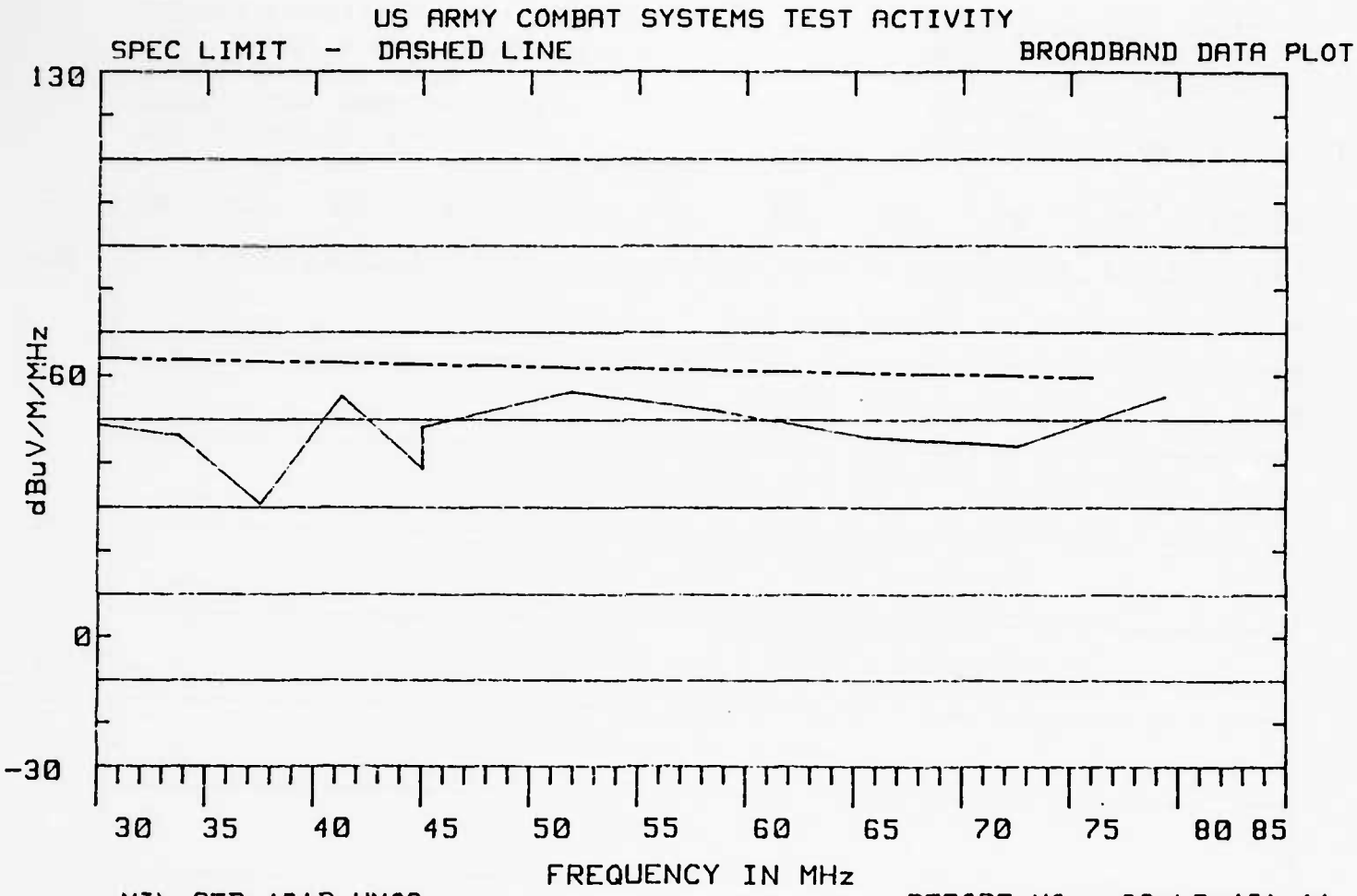

Figure 10. Radiated emissions.

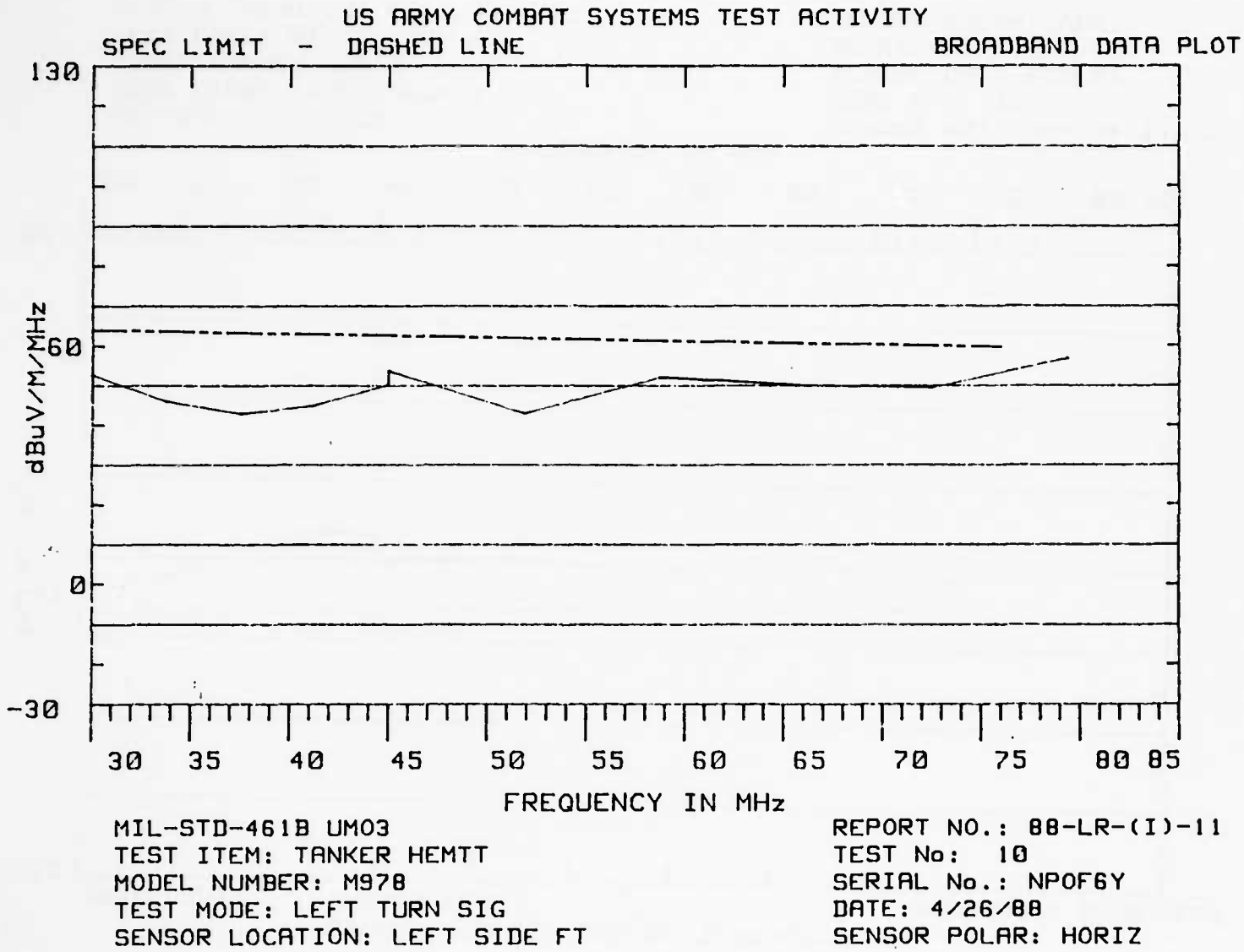

Figure 11. Radiated emissions.

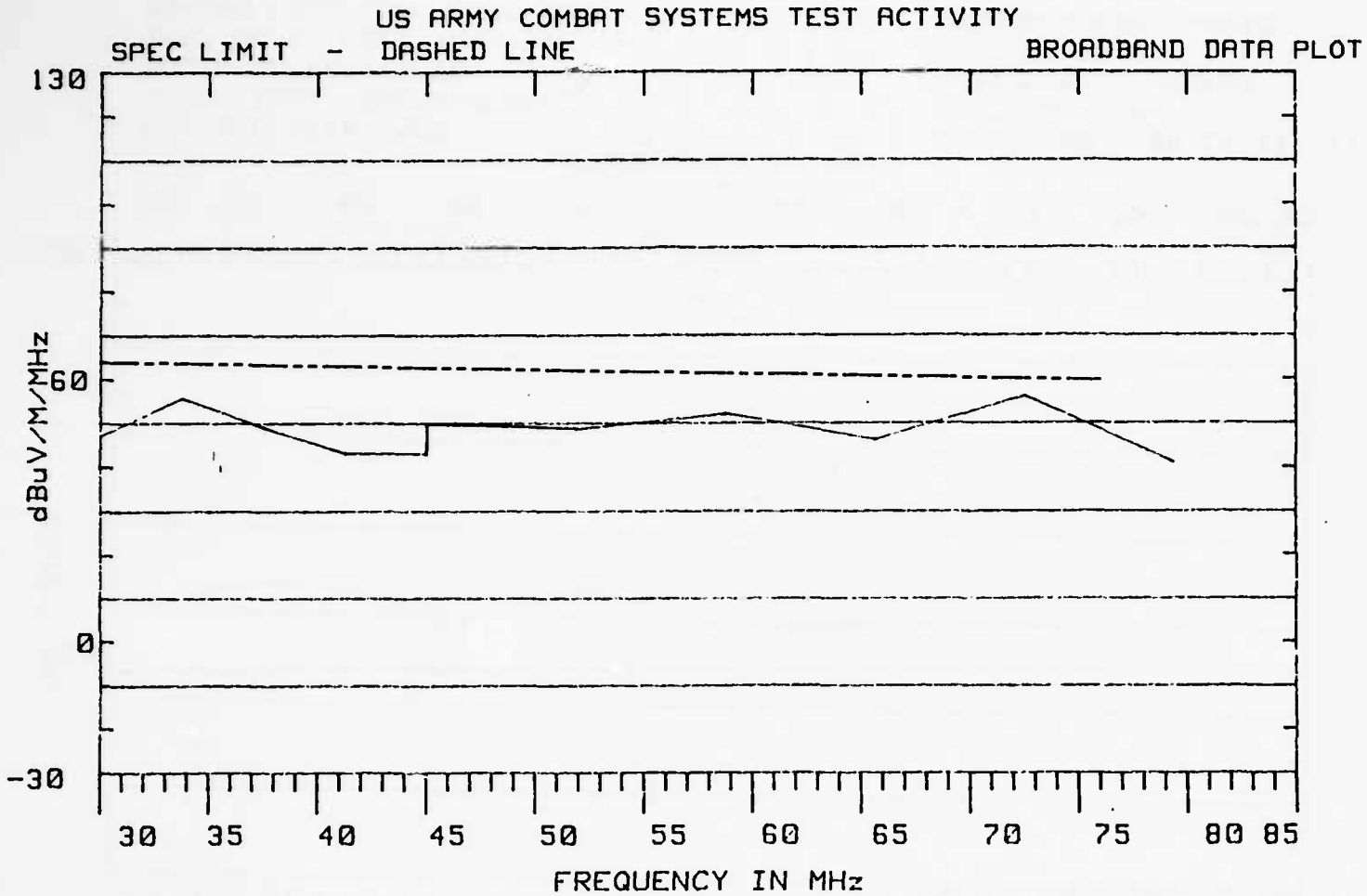

Figure 12. Radiated emissions.

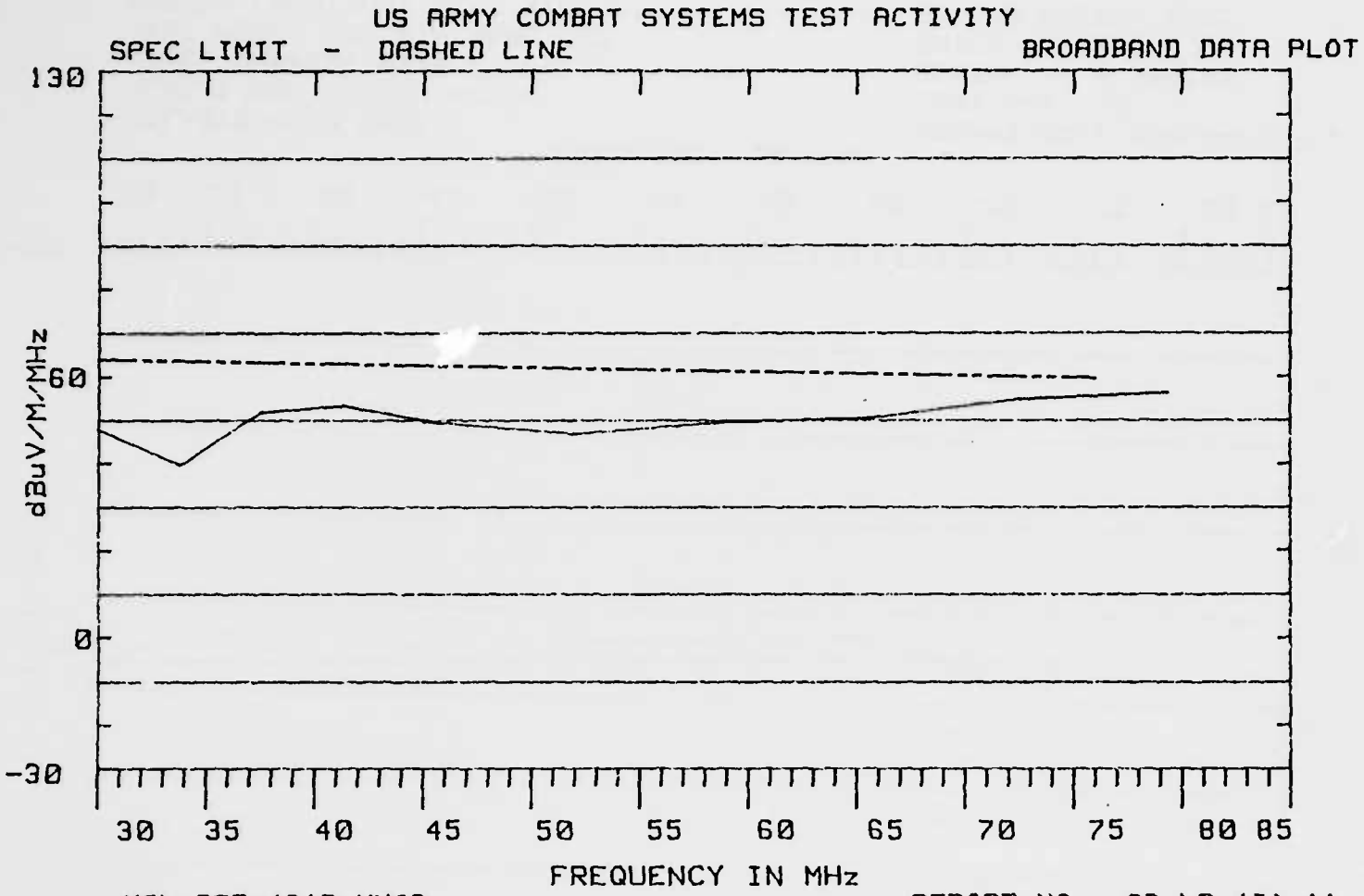

Figure 13. Radiated emissions.

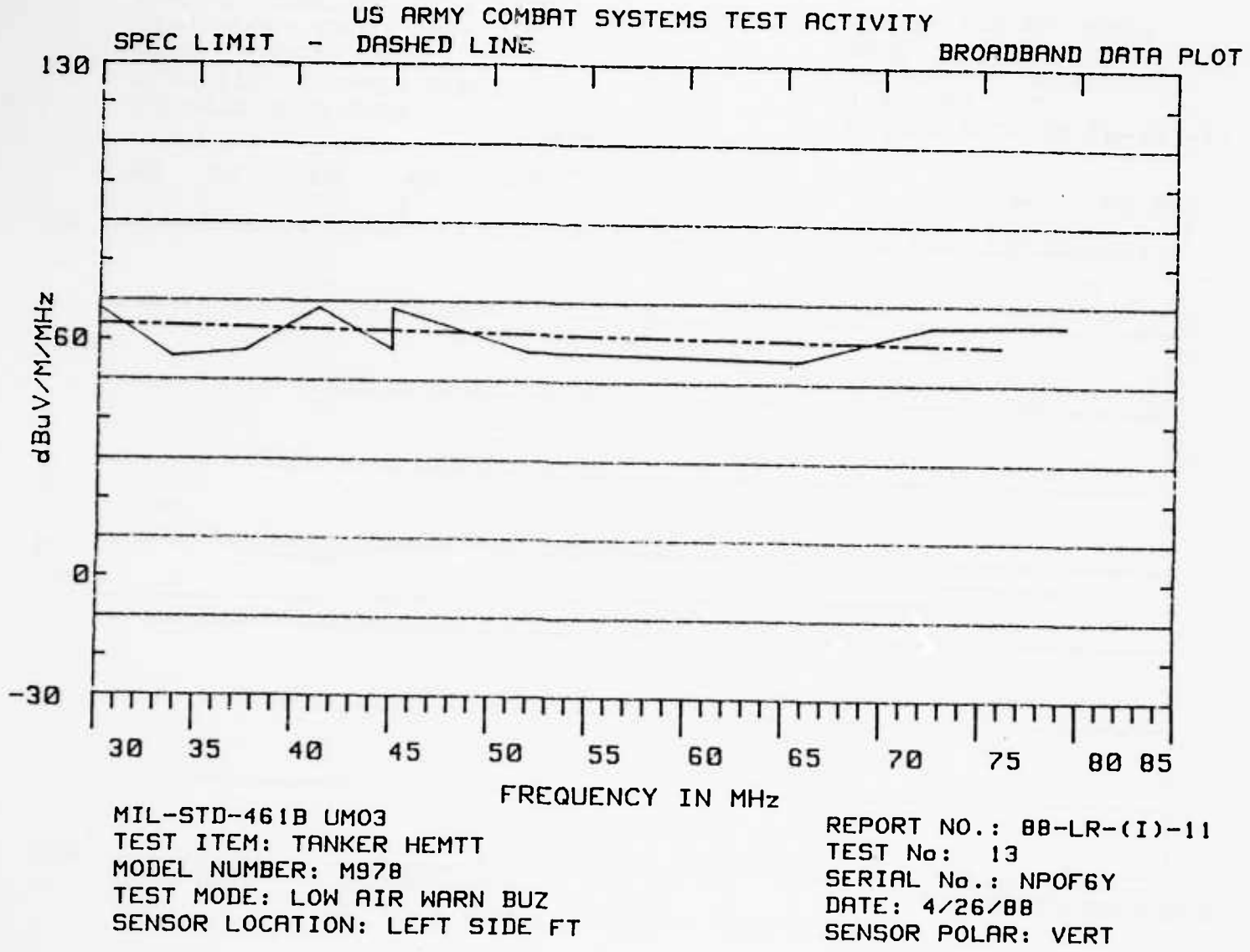

Figure 14. Radiated emissions.

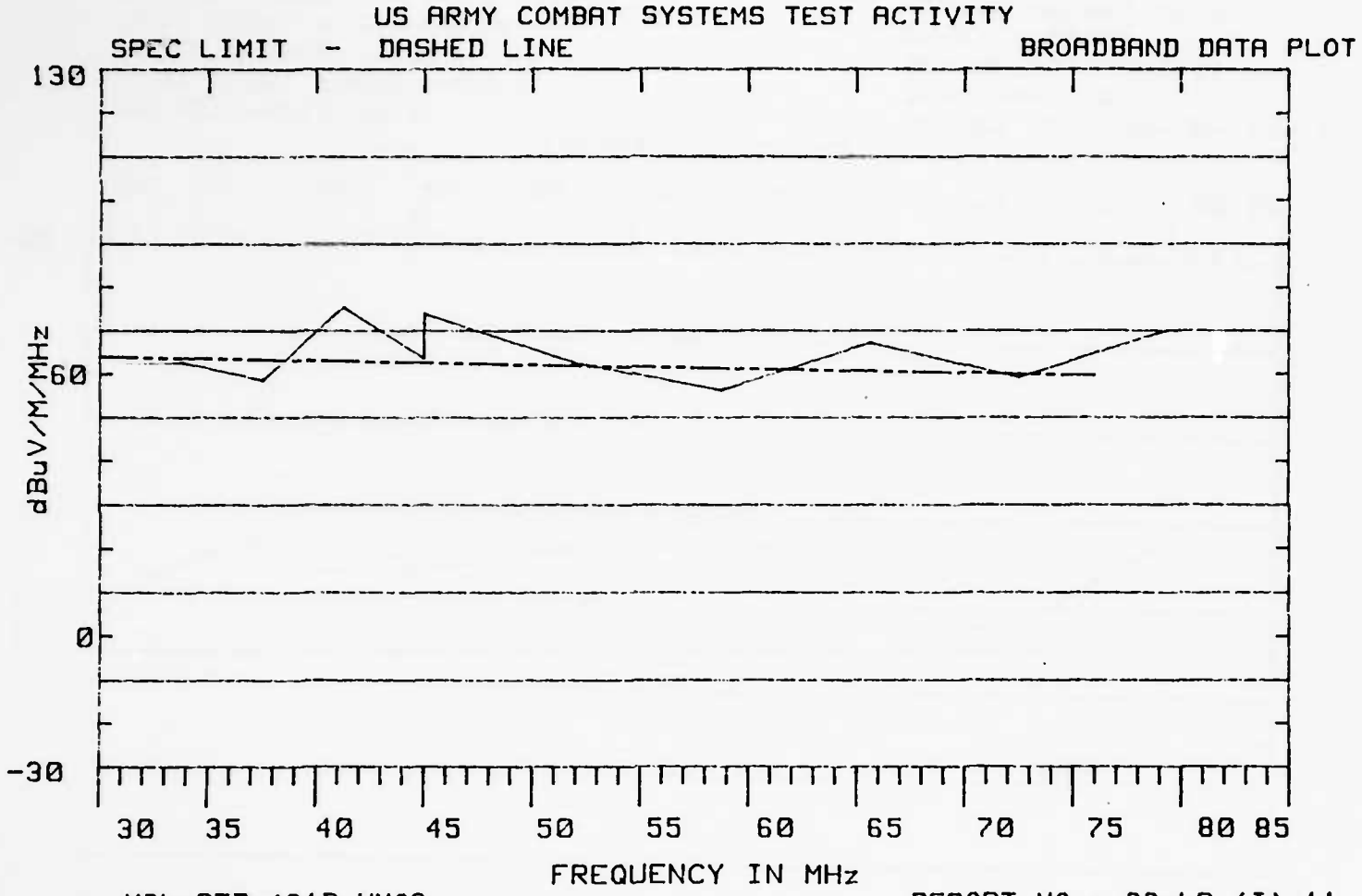

Figure 15. Radiated emissions.

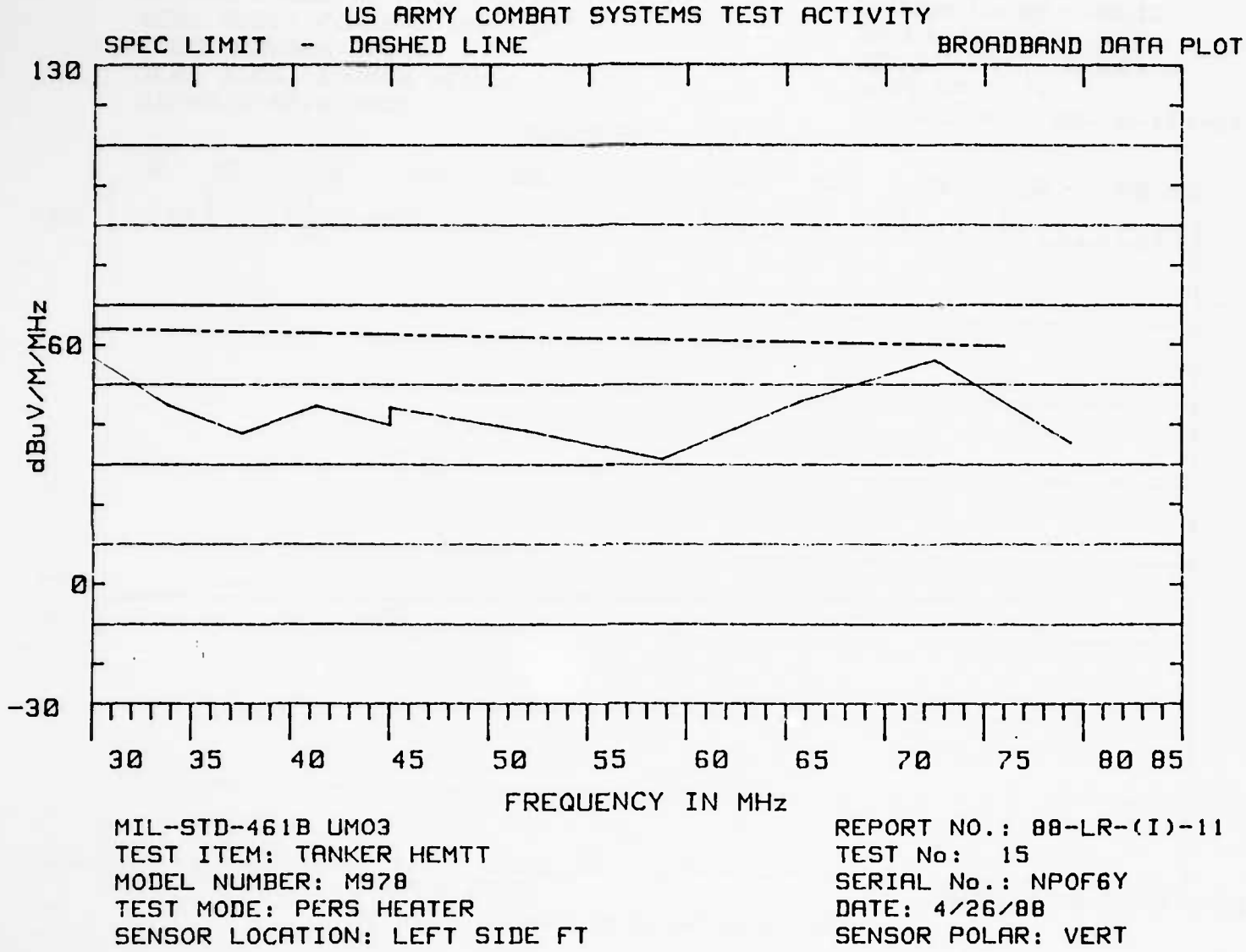

Figure 16. Radiated emissions.

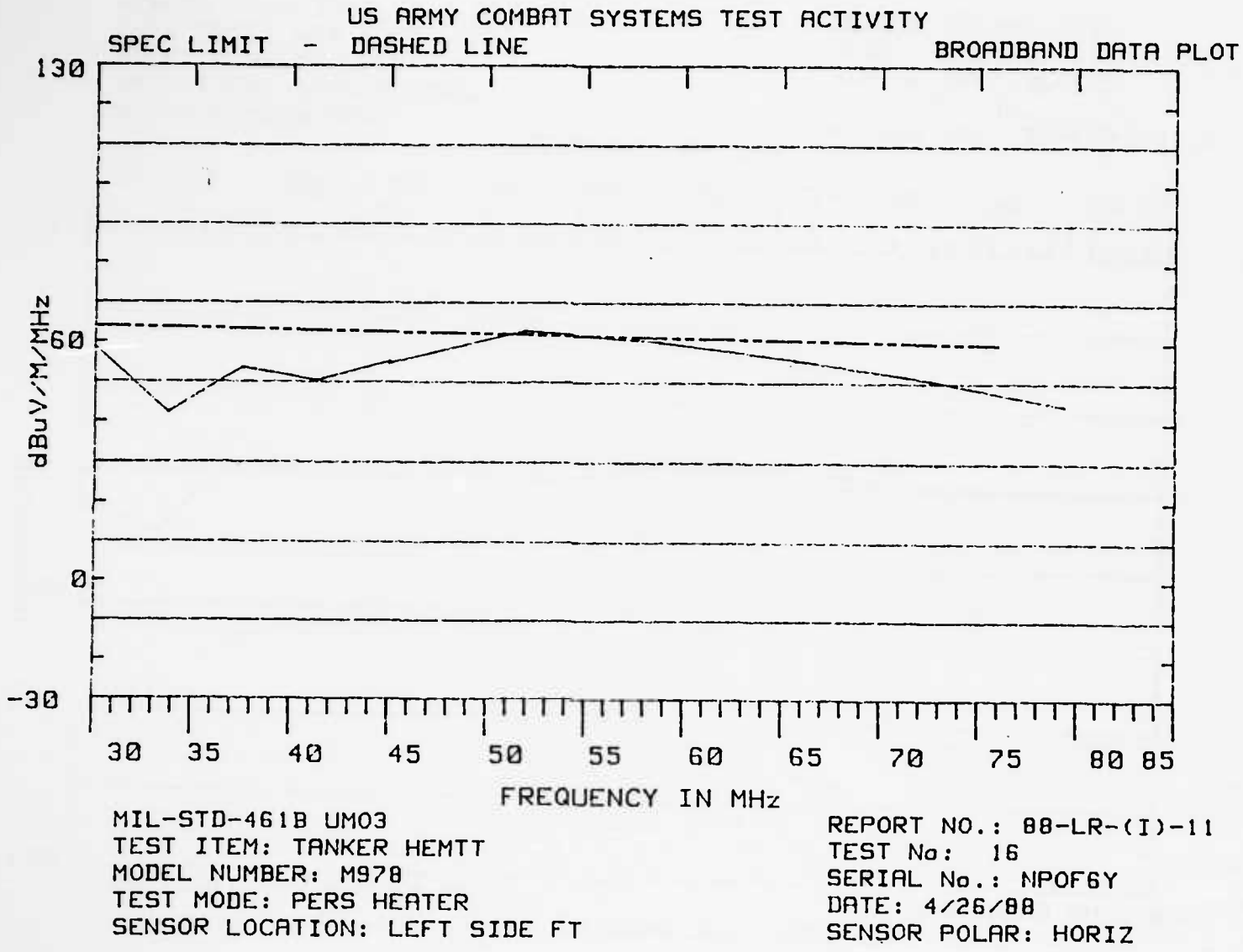

Figure 17. Radiated emissions.

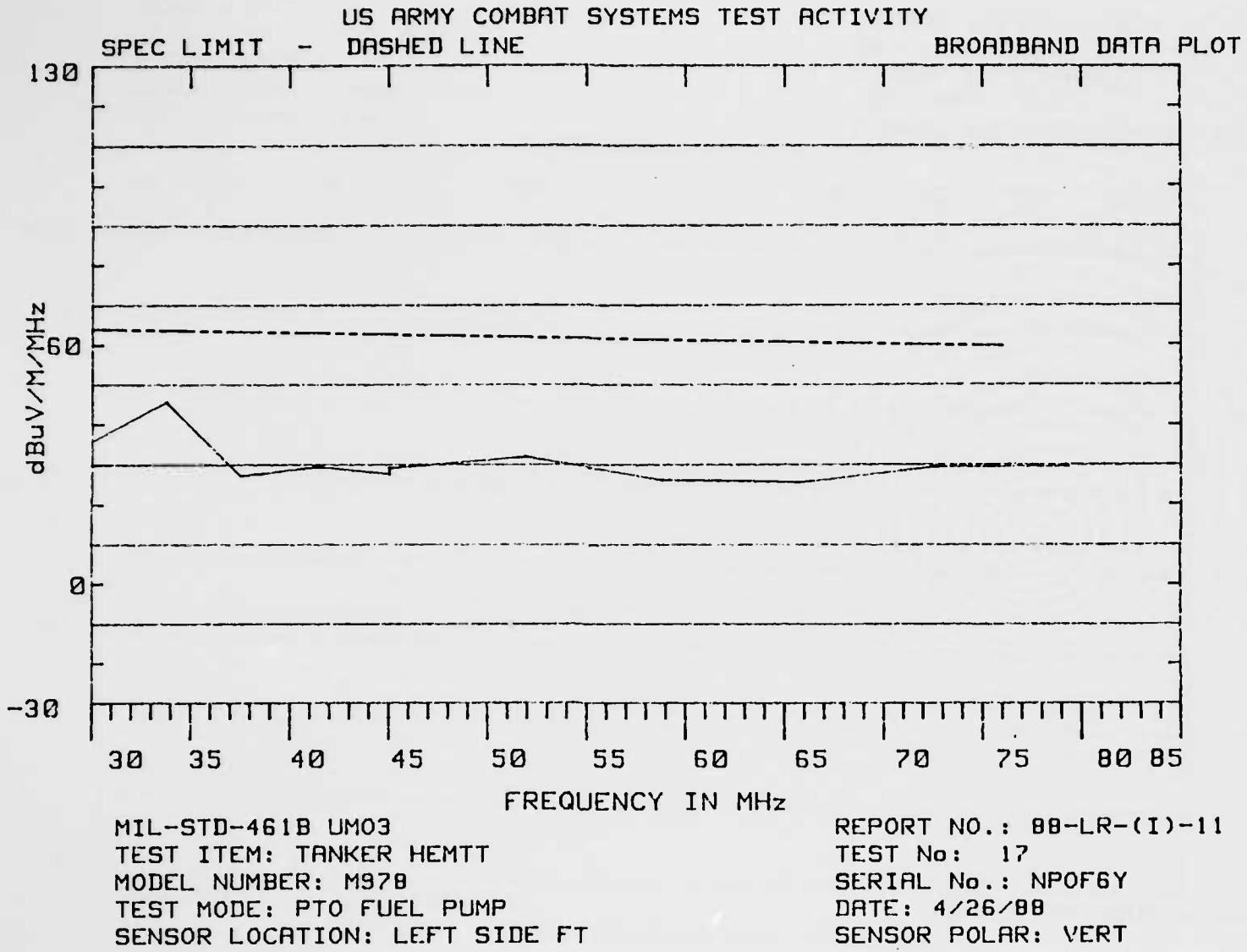

Figure 18. Radiated emissions.

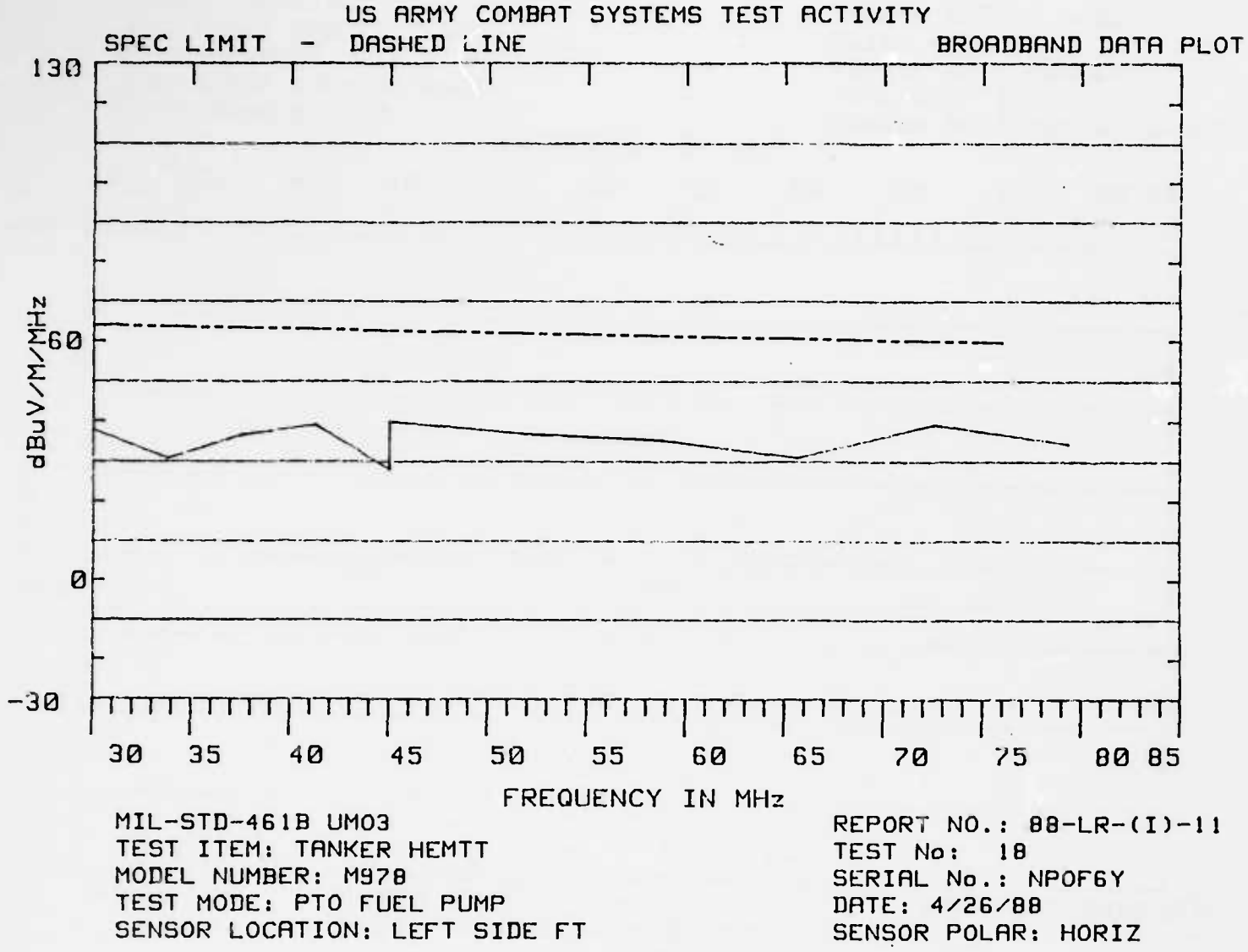

Figure 19. Radiated emissions.

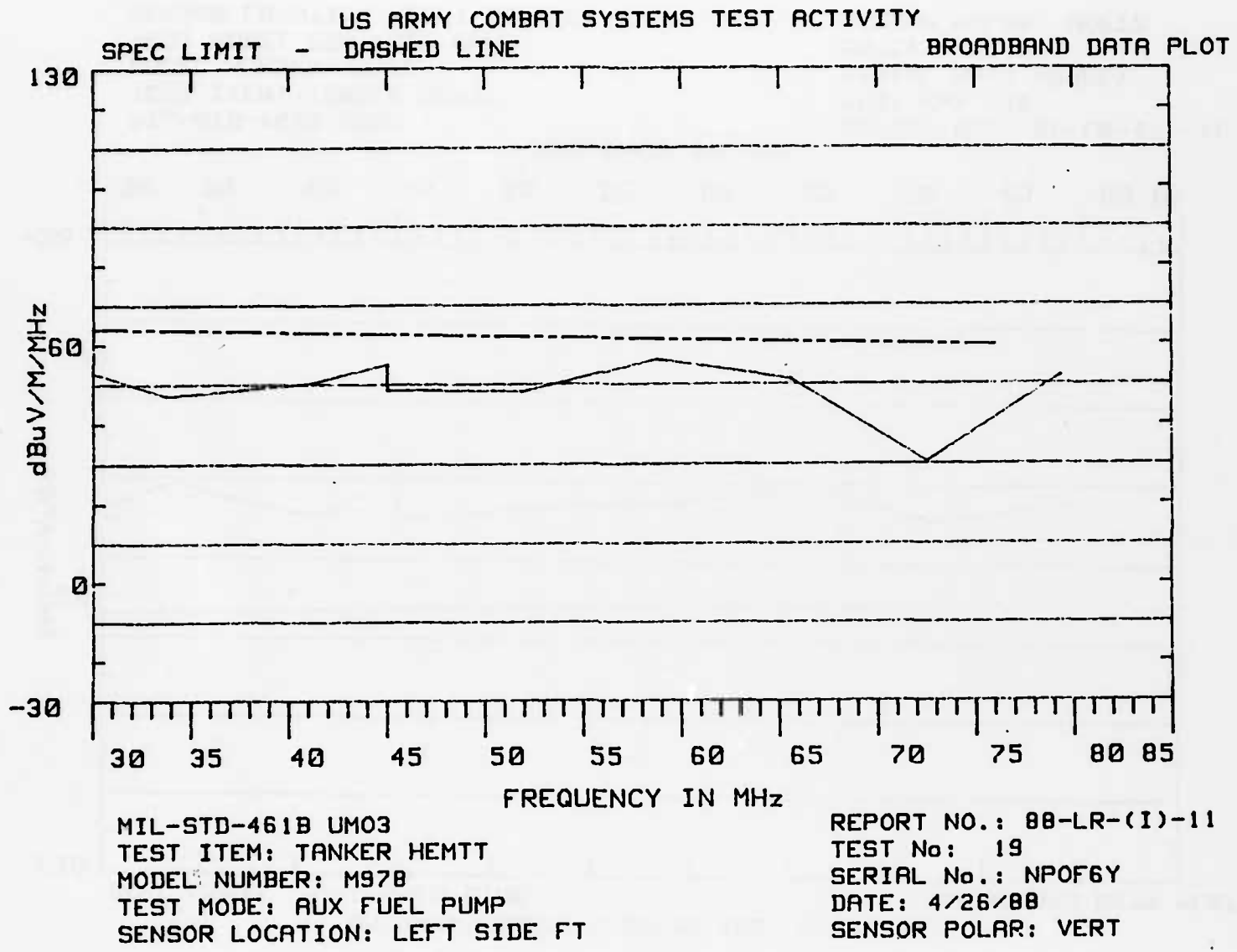

Figure 20. Radiated emissions.

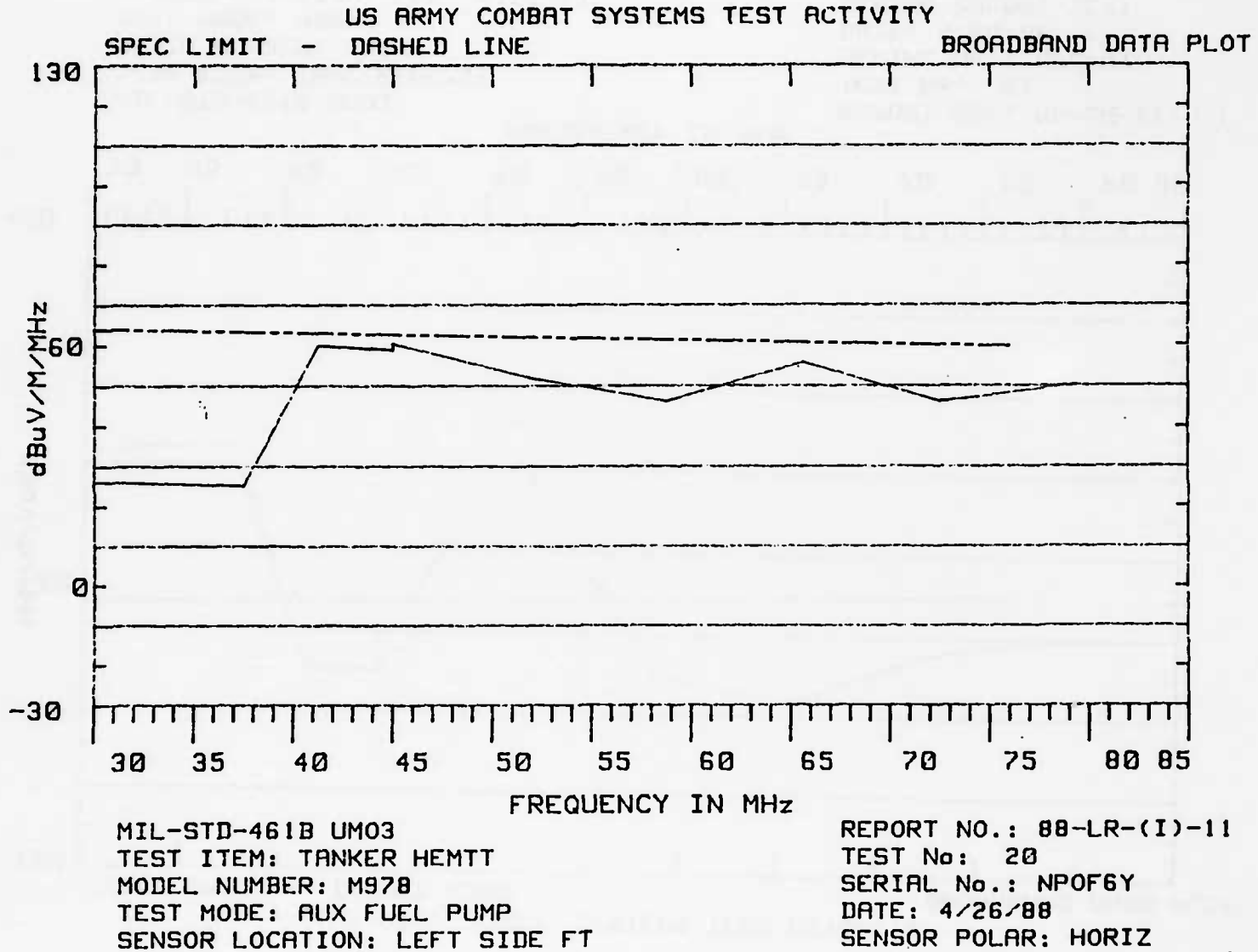

Figure 21. Radiated emissions.

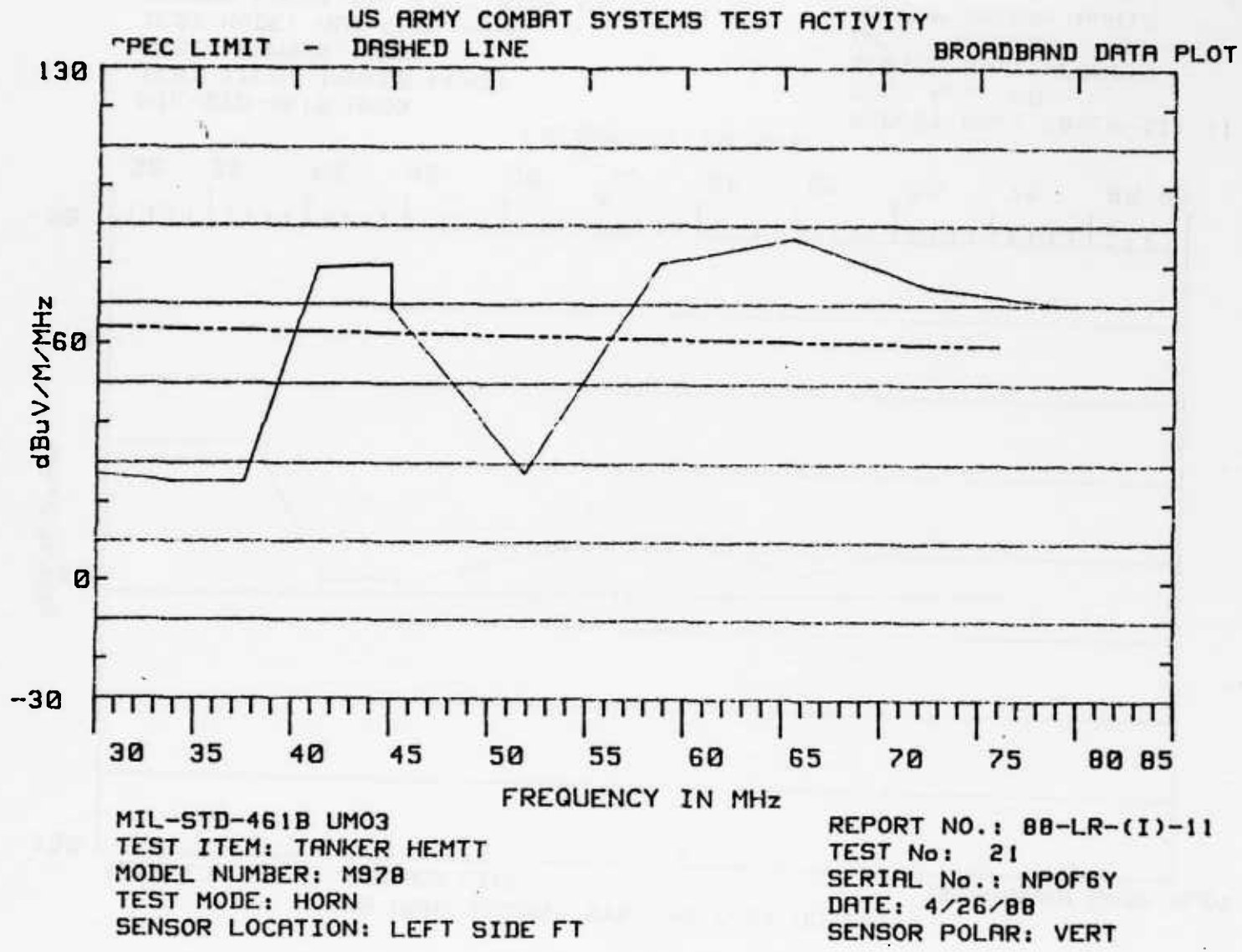

Figure 22. Radiated emissions.

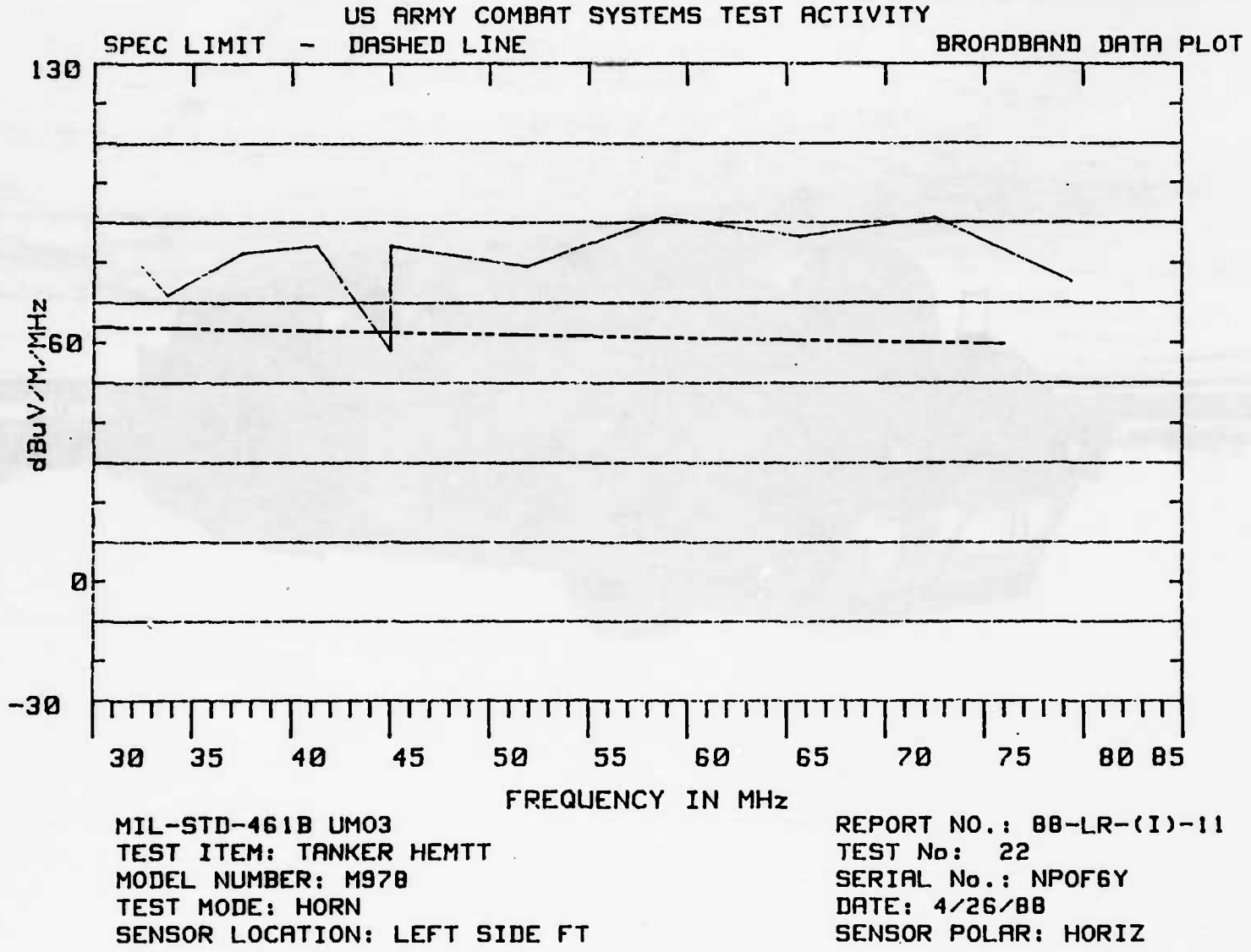

Figure 23. Radiated emissions.

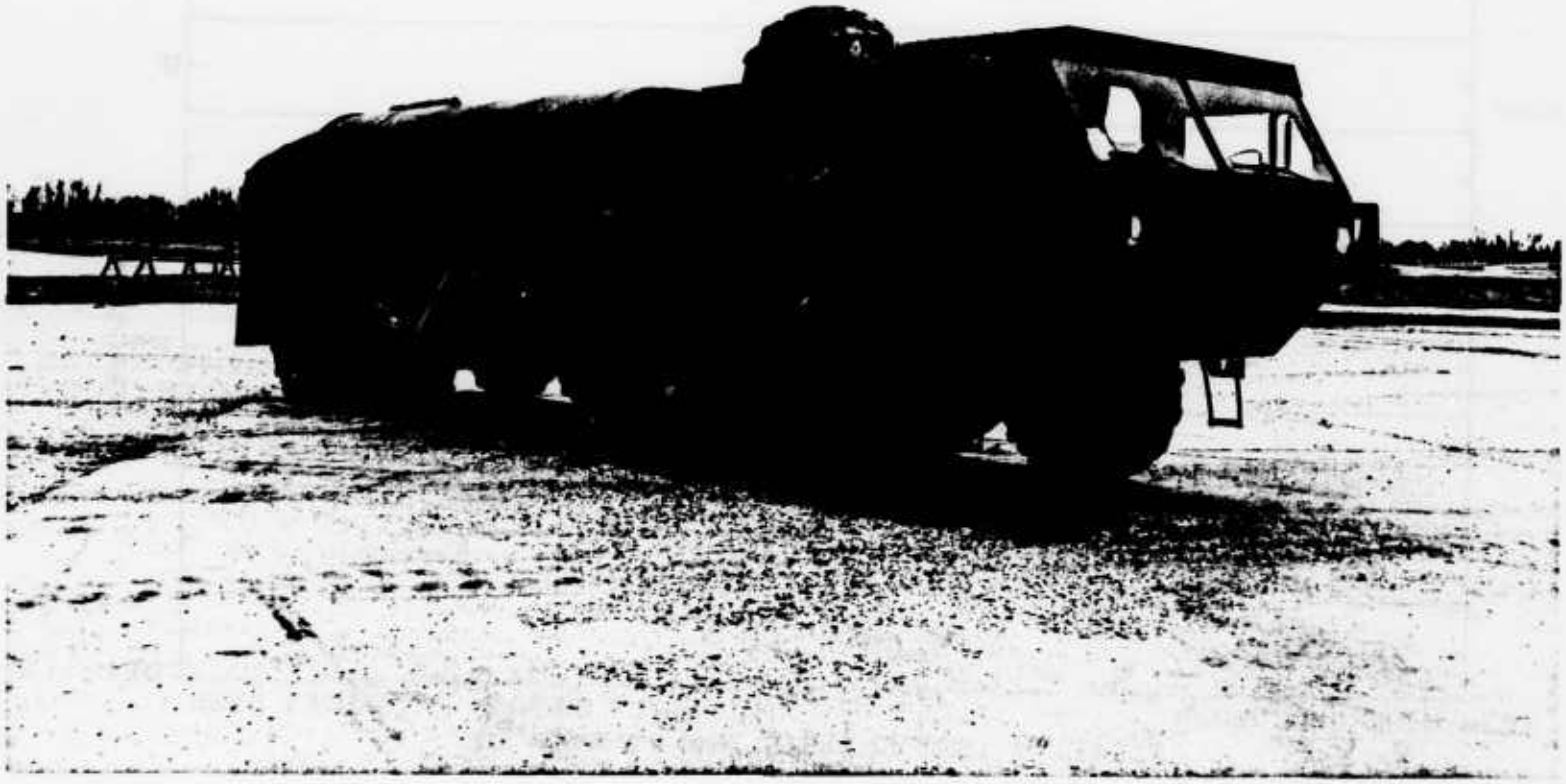

Figure 24. Front three-quarter view of the M978.

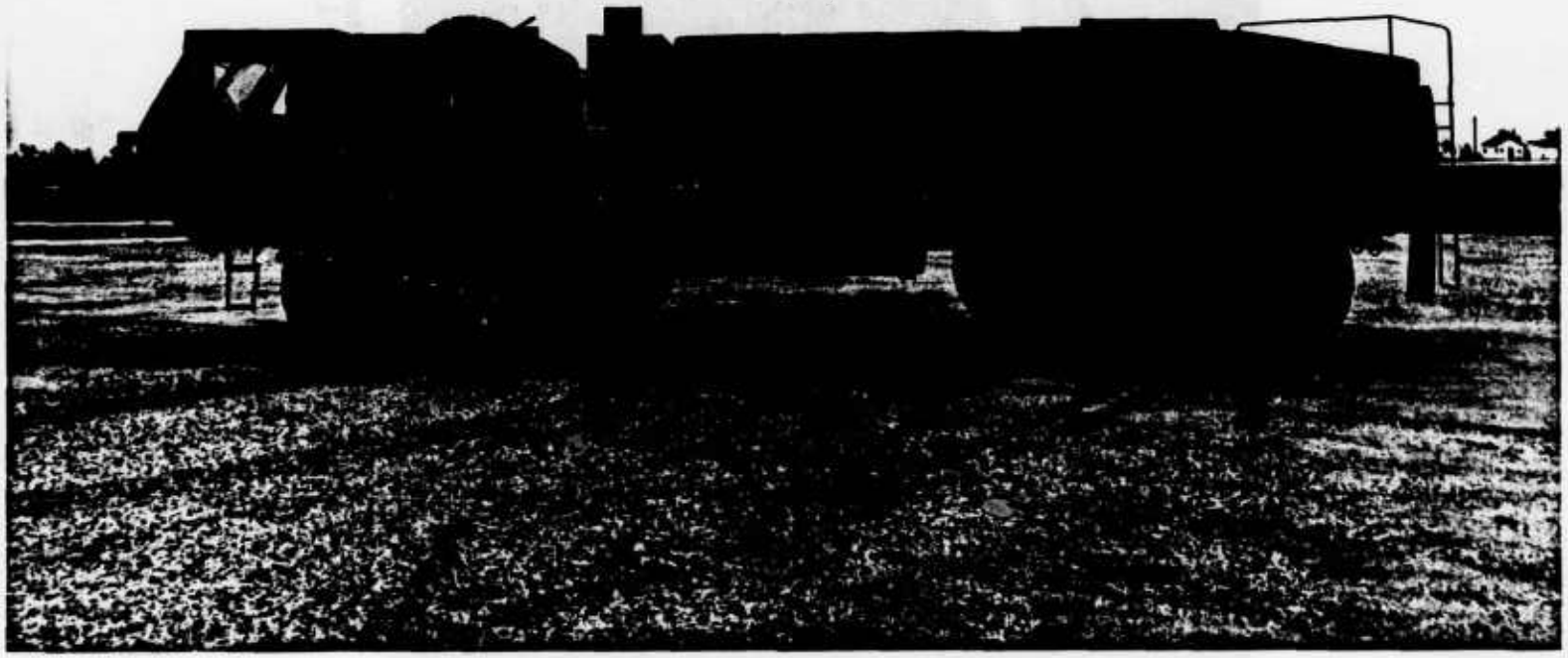

Figure 25. Side view of the M978.

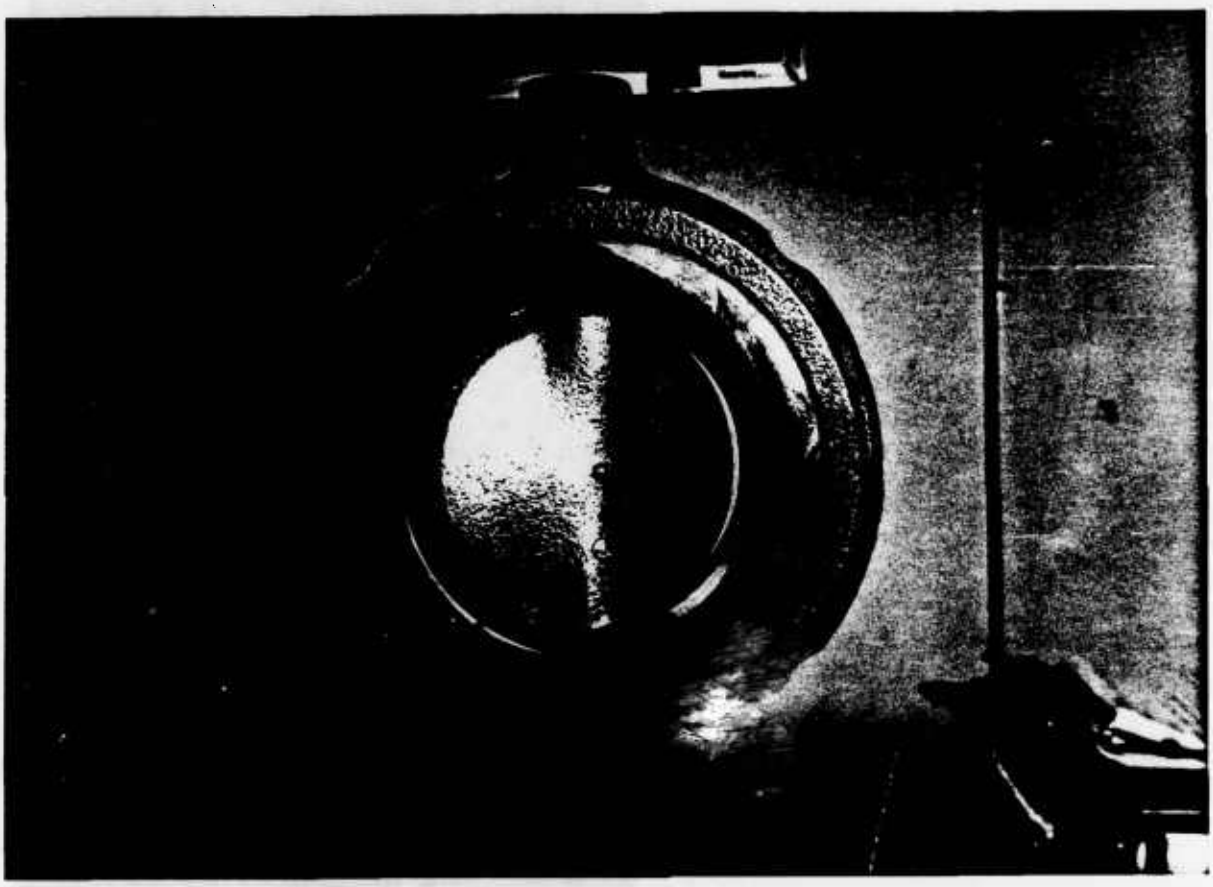

Figure 26. V5 butterfly valve before adjustment. Note the light around the sides of the disk indicating it is not centered in the valve seat.

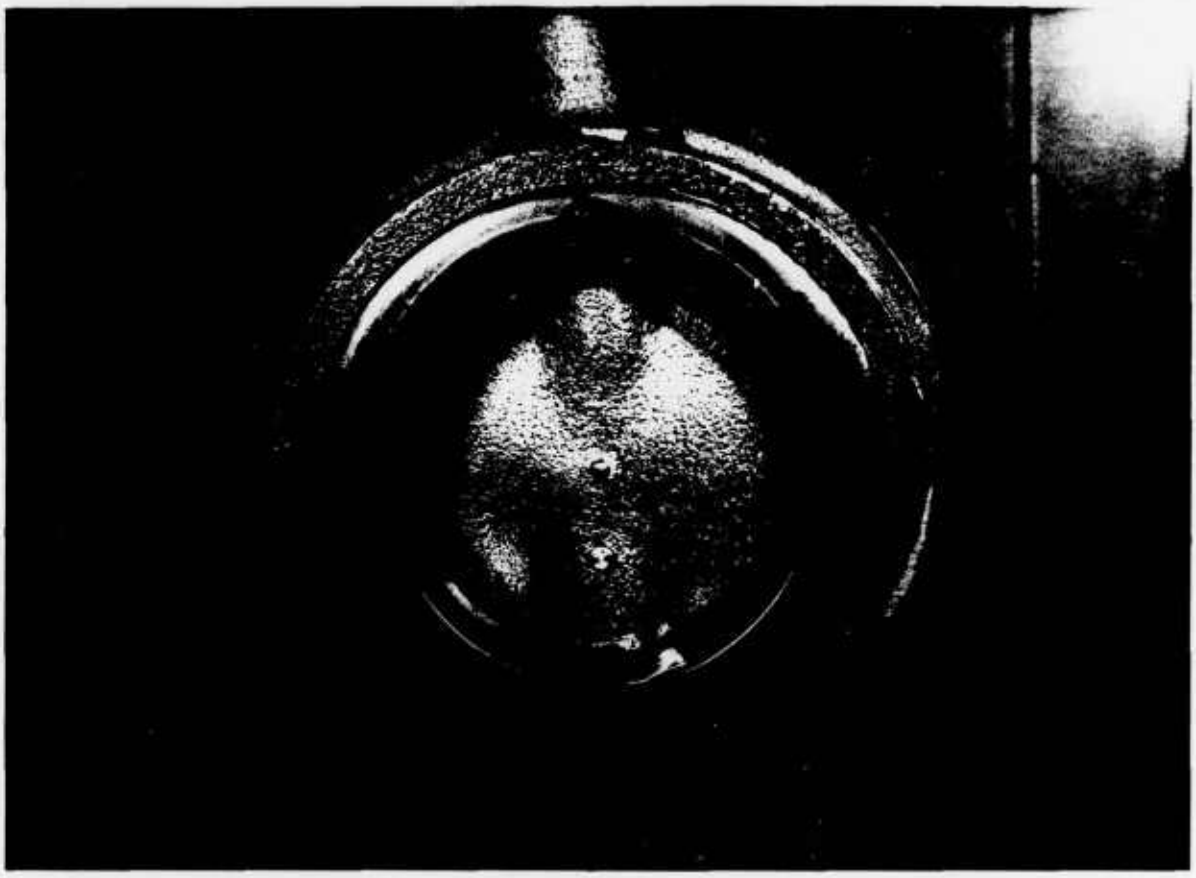

Figure 27. V5 butterfly valve after adjustment.

LOGISTICS SUPPORTABILITY DATA

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TECHNICAL DATA/EQUIPMENT PUBLICATIONS CHART (SOP: R/LDS 70-2)	PROJECT NUMBER 1-VG-120-HMT-028	END ITEM NOMENCLATURE TRUCK, TANK, FUEL, M978

MANUSCRIPT			DATE RECEIVED		EVALUATION		DATE FORM 2028 FORWARDED	REMARKS
NUMBER	QTY	TITLE	LIT	MAT	A	T		
1	2	3	4	5	6	7	8	9
LO9-2320-279-12	1	Lubrication Order - M977 Series, 8 X 8 Heavy Expanded Mobility Tactical Trucks (HEMTT)	Dec 87	Apr 88	X			
TM9-2320-279-10-1	1	Operator's Manual - M977 Series, 8 X 8 Heavy Expanded Mobility Tactical Trucks (HEMTT)	Nov 86	Apr 88	X			
TM9-2320-279-10-2	1	Operator's Manual - M977 Series, 8 X 8 Heavy Expanded Mobility Tactical Trucks (HEMTT)	Jun 87	Apr 88	X			
TM9-2320-279-20-1	1	Volume No. 1 Technical Manual Maintenance Instructions Organizational Maintenance, M977 Series, 8 X 8 Heavy Expanded Mobility Tactical Trucks (HEMTT)	Apr 87	Apr 88				Did not include engine cover removal procedure in radiator removal procedure. Level of maintenance not consistent in MAC (DS) and primary pump replace procedure (ORG).

STEAP-MT Form 259, 1 Jan 81 (Edition of 21 Aug 72 may be used.)

TECHNICAL DATA/EQUIPMENT PUBLICATIONS CHART (SOP: R/LDS 70-2)	PROJECT NUMBER 1-VG-120-HMT-028	END ITEM NOMENCLATURE TRUCK, TANK, FUEL, M978

MANUSCRIPT			DATE RECEIVED		EVALUATION		DATE FORM 2028 FORWARDED	REMARKS
NUMBER	QTY	TITLE	LIT	MAT	A	I		
1	2	3	4	5	6	7	8	9
TM9-2320-279-20-2	1	Volume No. 2 Technical Manual Maintenance Instructions Organizational Maintenance, M977 Series, 8 X 8 Heavy Expanded Mobility Tactical Trucks (HEMTT)	Apr 87		X			
TM9-2320-279-20-3	1	Volume No. 3 Technical Manual Maintenance Instructions Orgainzational Maintenance, M977 Series, 8 X 8 Heavy Expanded Mobility Tactical Trucks (HEMTT)	Apr 87		X			
TM9-2320-279-34-1	1	Volume No. 1 Technical Manual Maintenance Instructions, Direct and General Support, M977 Series, 8 X 8 Heavy Expanded Mobility Tactical Trucks (HEMTT)	Jun 86	Apr 88	X			
TM9-2320-279-34-2	1	Volume No. 2 Technical Manual Maintenance Instructions, Direct and General Support, M977 Series, 8 X 8 Heavy Expanded Mobility Tactical Trucks (HEMTT)	Jun 87	Apr 88	X			

STEAP-MT Form 259, 1 Jan 81 (Edition of 21 Aug 72 may be used.)

TECHNICAL DATA/EQUIPMENT PUBLICATIONS CHART (SOP: R/LDS 70-2)	PROJECT NUMBER 1-VG-120-HMT-028	END ITEM NOMENCLATURE TRUCK, TANK, FUEL, M978

MANUSCRIPT			DATE RECEIVED		EVALUATION		DATE FORM 2028 FORWARDED	REMARKS
NUMBER	QTY	TITLE	LIT	MAT	A	I		
1	2	3	4	5	6	7	8	9
TM9-2320-279-34-3	1	Volume No. 3 Technical Manual Maintenance Instructions, Direct and General Support, M977 Series, 8 X 8 Heavy Expanded Mobility Tactical Trucks (HEMTT)	Jun 87	Apr 88	X			
TM9-2320-279-20P	1	Technical Manual Organizational Maintenance Repair Parts and Special Tools List, M977 Series, 8 X 8 Heavy Expanded Mobility Tactical Trucks (HEMTT)	Mar 88	Apr 88	X			
TM9-2320-279-34P	1	Technical Manual Direct and General Support Maintenance Repair Parts and Special Tools List	Mar 88	Apr 88				The grease fitting on the tow pintle fluid passage bolt is not illustrated or listed in the manual. The three lights illustrated on instrument control panel (page 26-1) are not identified.

STEAP-MT Form 259, 1 Jan 81 (Edition of 21 Aug 72 may be used.)

TECHNICAL DATA/EQUIPMENT PUBLICATIONS CHART (SOP: R/LDS 70-2)		PROJECT NUMBER 1-VG-120-HMT-028					END ITEM NOMENCLATURE TRUCK, TANK, FUEL M978	
MANUSCRIPT			DATE RECEIVED		EVALUATION		DATE FORM 2028 FORWARDED	REMARKS
NUMBER	QTY	TITLE	LIT	MAT	A	I		
1	2	3	4	5	6	7	8	9
TM9-2815-224-34P	1	Direct and General Support Maintenance Manual (Including Repair Parts and Special Tools List), Engine, Diesel: 8-cylinder, turbocharged, Detroit Diesel Allison Model 8V92TA, NSN2815-01-132-1417	Jan 88	Apr 88	X			

STEAP-MT Form 259, 1 Jan 81 (Edition of 21 Aug 72 may be used.)

ITEM# NPOF6Y

SUPPLY SUPPORT CHART
CPT OF HEMTT, M978 TANKER
1-VG-120-HMT-028

DATE 12/05/88
PAGE 1

GROUP#	POS CDE	PART NUMBER	ACT TAK	QTY	PART NOMENCLATURE	SERIAL#	PART LIFE MILES	MOTHRS	PTOHRS	TIR NO.	REC#
0000		190 GM2	CON	1	NOZZLE, D-1	UNKNOWN	0.0	0.0	0.0	K2-E00016A	103
0100	NA	5115454	CON	1	SEAL,PLAIN	UNKNOWN	0.0	0.0	0.0	K2-E00015A	98
0106		MS35802-3	CON	1	ELEMENT,FILTER	UNKNOWN	0.0	0.0	0.0	K2-E00008A	50
0106		MS35802-3	CON	1	ELEMENT,FILTER	UNKNOWN	0.0	0.0	0.0	K2-E00022A	81
0106	NA	MS35802-3	CON	1	ELEMENT,FILTER	UNKNOWN	2253.0	90.8	22.5	K2-E00077A	329
0106	NA	MS35802-3	CON	1	FILTER ELEMENT, FLUID	UNKNOWN	2804.0	112.3	28.3	K2-E00056-	226
0106	NA	MS35802-3	CON	1	ELEMENT,FILTER	NA	2260.0	91.5	22.5	K2-E00077B	334
0306	NA	124661A	CON	3	STRAP	UNKNOWN	2804.0	112.3	28.1	K2-E00052-	218
0308	NA	1118191	REM	1	SOLENOID, ELECTRICAL	UNKNOWN	3788.0	152.3	40.2	K2-E00061-	267
0308	NA	P515-A57V24	INS	1	SOLENOID, ELECTRICAL	UNKNOWN	0.0	0.0	0.0	K2-E00061-	267
0309		2020	CON	1	ELEMENT,STRAINER	UNKNOWN	0.0	0.0	0.0	K2-E00008A	50
0309	NA	2020SM	CON	1	FILTER ELEMENT, FLUID	UNKNOWN	2804.0	112.3	28.3	K2-E00056-	226
0309		250107/8	INS	1	FILTER	UNKNOWN	0.0	0.0	0.0	K2-E00008A	50
0311	NA	LP535-1	CON	1	CYLINDER	UNKNOWN	0.0	0.0	0.0	K2-E00009-	49
0505		9480-3	CON	1	BELT, VEE	NA	0.0	0.0	0.0	K2-E00025A	94
0607		55020	CON	1	SWITCH,TOGGLE	UNKNOWN	0.0	0.0	0.0	K2-E00020A	79
0608	NA	EL23	CON	1	FLASHER,SIGNAL	UNKNOWN	0.0	0.0	0.0	K2-E00007-	24
0609	4B	MS15570-1251	CON	1	LAMP, INCANDESCENT	UNKNOWN	0.0	0.0	0.0	K2-E00054-	220
0612	RT	1322570U	INS	1	BATTERY BOX	UNKNOWN	0.0	0.0	0.0	K2-E00077B	334
0612		MS35000-3	CON	1	BATTERY	UNKNOWN	0.0	0.0	0.0	K2-E00024-	83
0613	UNKN	UNKNOWN	INS	1	RUBBER BOOT	UNKNOWN	0.0	0.0	0.0	K2-E00010A	96
0721		25010335	CON	1	FILTER, SPIN-ON	UNKNOWN	0.0	0.0	0.0	K2-E00008A	50
0721		25010335	CON	1	FILTER,SPIN-ON	UNKNOWN	0.0	0.0	0.0	K2-E00022A	81
0721	NA	25010335	CON	1	FILTER,ELEMENT	UNKNOWN	2253.0	90.8	22.5	K2-E00077A	329
0721	NA	HD223	CON	1	FILTER ELEMENT,FLUI	NA	5062.9	203.9	51.7	K2-E00077B	334
0801	TCOR	6-4-6761X	CON	1	YOKE,UNIVERSAL JOIN	UNKNOWN	0.0	0.0	0.0	K2-E00026B	112
0900	4P	906354-2631	CON	1	PROPELLER SHAFT	UNKNOWN	0.0	0.0	0.0	K2-E00026B	112
1004	NA	1026GX	CON	2	SEAL	UNKNOWN	753.0	28.1	6.8	K2-E00042A	146
1004	R1	1026GX	CON	2	SEAL	UNKNOWN	1376.0	52.9	12.3	K2-E00043A	176
1004	R1	1026GX	CON	2	SEAL	UNKNOWN	1376.0	52.9	12.3	K2-E00043A	176
1100	L3	13886	CON	1	GASKET	NA	5052.0	202.9	51.5	K2-E00076-	323
1100	L4	13886	CON	1	GASKET	NA	5052.0	202.9	51.5	K2-E00076-	323
1100	R3	13886	CON	1	GASKET	NA	5052.0	202.9	51.5	K2-E00076-	323
1100	R4	13886	CON	1	GASKET	NA	5052.0	202.9	51.5	K2-E00076-	323
112	TCOR	32397	CON	1	SEAL,PLAIN ENCASED	UNKNOWN	0.0	0.0	0.0	K2-E00026B	112
1208	NA	286645	CON	1	TANK,PRESSURE	UNKNOWN	0.0	0.0	0.0	K2-E00026A	111
1311	R1	415938	CON	1	SEAL,PLAIN ENCASED	NA	5052.0	202.9	51.5	K2-E00076-	323
1311	R2	415938	CON	1	SEAL,PLAIN ENCASED	NA	5052.0	202.9	51.5	K2-E00076-	323
1311	L1	415938	CON	1	SEAL,PLAIN ENCASED	NA	5052.0	202.9	51.5	K2-E00076-	323
1311	L2	415938	CON	1	SEAL,PLAIN ENCASED	NA	5052.0	202.9	51.5	K2-E00076-	323
1311	L4	B370003-BFO	CON	1	SEAL,PLAIN ENCASED	NA	5052.0	202.9	51.5	K2-E00076-	323
1311	L3	B370003-BGO	CON	1	SEAL,PLAIN ENCASED	NA	5052.0	202.9	51.5	K2-E00076-	323
1311	R3	B370003-BGO	CON	1	SEAL,PLAIN ENCASED	NA	5052.0	202.9	51.5	K2-E00076-	323
1311	R4	B370003-BGO	CON	1	SEAL,PLAIN ENCASED	NA	5052.0	202.9	51.5	K2-E00076-	323
1413		941107	CON	1	CARTRIDGE	UNKNOWN	0.0	0.0	0.0	K2-E00008A	50
1413		941107	CON	1	CARTRIDGE	UKNOWN	0.0	0.0	0.0	K2-E00022A	81
1413	NA	941107	CON	1	FILTER ELEMENT,FLUI	UNKNOWN	2253.0	90.8	22.5	K2-E00077A	329
1413	NA	941107	CON	1	FILTER ELEMENT, FLUID	UNKNOWN	2804.0	112.3	28.3	K2-E00056-	226
1413	NA	941107	CON	1	FILTER ELEMENT,FLUI	NA	2260.0	91.5	22.5	K2-E00077B	334
1501	NA	110310A	CON	1	NUT,SELF-LOCKING,EX	NA	5062.0	203.5	51.5	K2-E00078-	332
1501	NA	111314A	CON	1	SCREW,CAP,HEXAGON H	NA	5062.0	203.5	51.5	K2-E00078-	332

GROUP#	POS CDE	PART NUMBER	ACT TAK	QTY	PART NOMENCLATURE	SERIAL#	PART LIFE MILES	MOTHRS	PTOHRS	TIR NO.	REC#
1504	NA	1350450	INS	1	STRAP,WEBBING	UNKNOWN	0.0	0.0	0.0	K2-E00036-	131
1604	R1	680175	CON	1	SHOCK ABSORBER	UNKNOWN	0.0	0.0	0.0	K2-E00023-	85
1802	NA	115303A	INS	2	NUT,SELF-LOCKING	UNKNOWN	0.0	0.0	0.0	K2-E00035-	130
1802		24C67CQ01	INS	2	BOLT,SELF-LOCKING	UNKNOWN	0.0	0.0	0.0	K2-E00035-	130
1802	NA	31WLFS51618-1.25	INS	1	BOLT,MACHINE	UNKNOWN	0.0	0.0	0.0	K2-E00037-	132
1802	NA	MS17829-5C	INS	1	NUT,SELF-LOCKING	UNKNOWN	0.0	0.0	0.0	K2-E00037-	132
2001	NA	1352770	CON	1	SHAFT,STRAIGHT	UNKNOWN	0.0	0.0	0.0	K2-E00033A	177
2001	FT	137233OU	INS	1	GUIDE ASSY,FRONT	UNKNOWN	0.0	0.0	0.0	K2-E00077B	334
2202	NA	45A254-P3	CON	1	HOSE,TWIN	UNKNOWN	0.0	0.0	0.0	K2-E00012-	61
303		59027AX	REM	2	SCREW,MACH,FLAT,HD	UNKNOWN	0.0	0.0	0.0	K2-E00022A	81
3303		028-561	INS	3	BRACKET, HOOD	UNKNOWN	0.0	0.0	0.0	K2-E00008A	50
3303		028-561	REM	3	BRACKET,HOOD	UNKNOWN	0.0	0.0	0.0	K2-E00022A	81
3303	NA	028-561	INS	3	HOOK,SUPPORT	UNKNOWN	0.0	0.0	0.0	K2-E00077A	329
3303	NA	028-561	REM	3	HOOK,SUPPORT	NA	0.0	0.0	0.0	K2-E00077B	334
3303		110995A	INS	4	SCREW,CAP,HEX HD	UNKNOWN	0.0	0.0	0.0	K2-E00008A	50
3303		110995A	REM	4	SCREW,CAP,HEX,HD	UNKNOWN	0.0	0.0	0.0	K2-E00022A	81
3303	NA	110995A	INS	4	SCREW,CAP,HEXAGON	UNKNOWN	0.0	0.0	0.0	K2-E00077A	329
3303	NA	110995A	REM	4	SCREW,CAP,HEXAGON H	NA	0.0	0.0	0.0	K2-E00077B	334
3303		112575A	INS	6	WASHER	UNKNOWN	0.0	0.0	0.0	K2-E00008A	50
3303		112575A	REM	6	WASHER	UNKNOWN	0.0	0.0	0.0	K2-E00022A	81
3303		114357A	INS	3	NUT,SELF-LOCKING	UNKNOWN	0.0	0.0	0.0	K2-E00008A	50
3303		114357A	REM	3	NUT,SELF-LOCKING	UNKNOWN	0.0	0.0	0.0	K2-E00022A	81
3303	NA	114357A	INS	3	NUT,SELF-LOCKING	UNKNOWN	0.0	0.0	0.0	K2-E00077A	329
3303		114357A	REM	3	NUT,SELF-LOCKING,HE	NA	0.0	0.0	0.0	K2-E00077B	334
3303		133094 OU	REM	1	BATTERY BOX ASSY	UNKNOWN	0.0	0.0	0.0	K2-E00022A	81
3303		1330940U	INS	1	BATTERY BOX ASSY	UNKNOWN	0.0	0.0	0.0	K2-E00008A	50
3303	NA	1330940U	INS	1	BATTERY BOX	UNKNOWN	0.0	0.0	0.0	K2-E00077A	329
3303	NA	1330940U	REM	1	BATTERY BOX	NA	0.0	0.0	0.0	K2-E00077B	334
3303		135369 OU	REM	1	ENGINE ARCTIC KIT	UNKNOWN	0.0	0.0	0.0	K2-E00022A	81
3303		1353690U	INS	1	ENGINE ARTIC KIT	UNKNOWN	0.0	0.0	0.0	K2-E00008A	50
3303	NA	1353690U	INS	1	WINTERIZATION KIT,V	UNKNOWN	0.0	0.0	0.0	K2-E00077A	329
3303	NA	1353690U	REM	1	WINTERIZATION KIT,V	NA	0.0	0.0	0.0	K2-E00077B	334
3303		1367HX1	INS	2	SCREW,CAP,HEX	UNKNOWN	0.0	0.0	0.0	K2-E00008A	50
3303		1367HX1	REM	2	SCREW,CAP,HEX	UNKNOWN	0.0	0.0	0.0	K2-E00022A	81
3303		1367HX1	REM	2	SCREW,CAP,HEXAGON H	NA	0.0	0.0	0.0	K2-E00077B	334
3303		137200U	INS	1	SUPPORT, SIDE	UNKNOWN	0.0	0.0	0.0	K2-E00008A	50
3303		1372000	REM	1	SUPPORT,SIDE	UNKNOWN	0.0	0.0	0.0	K2-E00022A	81
3303	NA	1372000	INS	1	TRAY,BATTERY	UNKNOWN	0.0	0.0	0.0	K2-E00077A	329
3303	NA	1372000	REM	1	TRAY,BATTERY	NA	0.0	0.0	0.0	K2-E00077B	334
3303		1372010	INS	2	HOLD DOWN BATTERY	UNKNOWN	0.0	0.0	0.0	K2-E00008A	50
3303		1372010	REM	2	HOLD DOWN BATTERY	UNKNOWN	0.0	0.0	0.0	K2-E00022A	81
3303	NA	1372010	INS	2	RETAINER,BATTERY	UNKNOWN	0.0	0.0	0.0	K2-E00077A	329
3303	NA	1372010	REM	2	RETAINER,BATTERY	NA	0.0	0.0	0.0	K2-E00077B	334
3303		1383550	INS	1	CABLE ASSY	UNKNOWN	0.0	0.0	0.0	K2-E00008A	50
3303		1383550	REM	1	CABLE ASSY	UNKNOWN	0.0	0.0	0.0	K2-E00022A	81
3303	NA	1383550	INS	1	CABLE ASSY	UNKNOWN	0.0	0.0	0.0	K2-E00077A	329
3303	NA	1383550	REM	1	CABLE ASSY	NA	0.0	0.0	0.0	K2-E00077B	334
3303		149739 OW	REM	1	COVER BATTERY	UNKNOWN	0.0	0.0	0.0	K2-E00022A	81
3303		1497390W	INS	1	COVER, BATTERY	UNKNOWN	0.0	0.0	0.0	K2-E00008A	50
3303	NA	1497390W	INS	1	COVER,BATTERY	UNKNOWN	0.0	0.0	0.0	K2-E00077A	329
3303	NA	1497390W	REM	1	COVER,BATTERY BOX	NA	0.0	0.0	0.0	K2-E00077B	334

GROUP#	POS CDE	PART NUMBER	ACT TAK	QTY	PART NOMENCLATURE	SERIAL#	PART LIFE MILES	MOTHRS	PTOHRS	TIR NO.	REC#
3303		1849HX1	INS	3	SCREW,CAP,HEX	UNKNOWN	0.0	0.0	0.0	K2-E00008A	50
3303		1849HX1	REM	3	SCREW,CAP,HEX	UNKNOWN	0.0	0.0	0.0	K2-E00022A	81
3303	NA	1849HX1	INS	3	BOLT,MACHINE	UNKNOWN	0.0	0.0	0.0	K2-E00077A	329
3303	NA	1849HX1	REM	3	BOLT,MACHINE	NA	0.0	0.0	0.0	K2-E00077B	334
3303	NA	21NE-040	INS	2	NUT,SELF-LOCKING	UNKNOWN	0.0	0.0	0.0	K2-E00077A	329
3303	NA	21NE-040	REM	6	NUT,SELF-LOCKING,HE	NA	0.0	0.0	0.0	K2-E00077B	334
3303		21NE-066	INS	4	NUT,LOCK	UNKNOWN	0.0	0.0	0.0	K2-E00008A	50
3303	NA	21NE-066	INS	4	NUT,SELF-LOCKING	UNKNOWN	0.0	0.0	0.0	K2-E00077A	329
3303	NA	21NE-066	REM	4	NUT,SELF-LOCKING,HE	NA	0.0	0.0	0.0	K2-E00077B	334
3303		21NE-C66	REM	6	NUT,LOCK	UNKNOWN	0.0	0.0	0.0	K2-E00022A	81
3303		22NM-04	INS	6	NUT,SELF-LOCKING	UNKNOWN	0.0	0.0	0.0	K2-E00008A	50
3303		22NM-04	REM	6	NUT,SELF-LOCKING	UNKNOWN	0.0	0.0	0.0	K2-E00022A	81
3303		277-A-80-1	INS	3	BRACKET,HOOK,ANCHOR	UNKNOWN	0.0	0.0	0.0	K2-E00008A	50
3303		277-A-80-1	REM	3	BRACKET,HOOK,ANCHOR	UNKNOWN	0.0	0.0	0.0	K2-E00022A	81
3303	NA	277-A-80-1	INS	3	STRAP,RETAINING	UNKNOWN	0.0	0.0	0.0	K2-E00077A	329
3303	NA	277-A-80-1	REM	3	STRAP,RETAINING	NA	0.0	0.0	0.0	K2-E00077B	334
3303		354AX	INS	2	WASHER,LOCK	UNKNOWN	0.0	0.0	0.0	K2-E00008A	50
3303		354AX	REM	2	WASHER,LOCK	UNKNOWN	0.0	0.0	0.0	K2-E00022A	81
3303	NA	354AX	INS	3	WASHER,LOCK	UNKNOWN	0.0	0.0	0.0	K2-E00077A	329
3303	NA	354AX	REM	2	WASHER,LOCK	NA	0.0	0.0	0.0	K2-E00077B	334
3303		35633AX60U	INS	1	CABLE, 60 INCH	UNKNOWN	0.0	0.0	0.0	K2-E00008A	50
3303		35633AX60U	REM	1	CABLE, 60 INCH	UNKNOWN	0.0	0.0	0.0	K2-E00022A	81
3303	NA	35633AX60U	INS	1	CABLE,60 INCH	UNKNOWN	0.0	0.0	0.0	K2-E00077A	329
3303	NA	35633AX60U	REM	1	CABLE,60 INCH	NA	0.0	0.0	0.0	K2-E00077B	334
3303		362AX	INS	8	WASHER,FLAT,PLAIN	UNKNOWN	0.0	0.0	0.0	K2-E00008A	50
3303		362AX	REM	8	WASHER,FLAT,PLAIN	UNKNOWN	0.0	0.0	0.0	K2-E00022A	81
3303		369AX1	INS	2	NUT,PLAIN,HEX	UNKNOWN	0.0	0.0	0.0	K2-E00008A	50
3303		369AX1	REM	2	NUT,PLAIN,HEX	UNKNOWN	0.0	0.0	0.0	K2-E00022A	81
3303	NA	369AX1	INS	3	NUT,PLAIN,HEX	UNKNOWN	0.0	0.0	0.0	K2-E00077A	329
3303	NA	369AX1	REM	2	NUT,PLAIN,HEXAGON	NA	0.0	0.0	0.0	K2-E00077B	334
3303		59027AX	INS	2	SCREW,MACH,FLAT,HD	UNKNOWN	0.0	0.0	0.0	K2-E00008A	50
3303	NA	59027AX	INS	2	SCREW,MACHINE	UNKNOWN	0.0	0.0	0.0	K2-E00077A	329
3303	NA	59027AX	INS	2	SCREW,MACHINE	UNKNOWN	0.0	0.0	0.0	K2-E00077A	329
3303	NA	59027AX	REM	6	SCREW,MACHINE	NA	0.0	0.0	0.0	K2-E00077B	334
3303		5903 CAX	INS	6	SCREW,MACHINE,PAN	UNKNOWN	0.0	0.0	0.0	K2-E00008A	50
3303		5903 CAX	REM	6	SCREW,MACHINE,PAN	UNKNOWN	0.0	0.0	0.0	K2-E00022A	81
3303		61340AX48U	INS	1	CABLE, 48 INCH	UNKNOWN	0.0	0.0	0.0	K2-E00008A	50
3303		61340AX48U	REM	1	CABLE ,48 INCH	UNKNOWN	0.0	0.0	0.0	K2-E00022A	81
3303	NA	61340AX48U	INS	1	CABLE,48 INCH	UNKNOWN	0.0	0.0	0.0	K2-E00077A	329
3303	NA	61340AX48U	REM	1	CABLE,48 INCH	NA	0.0	0.0	0.0	K2-E00077B	334
3303		66419AX	INS	2	NUT,HEX	UNKNOWN	0.0	0.0	0.0	K2-E00008A	50
3303		66419AX	REM	2	NUT,HEX	UNKNOWN	0.0	0.0	0.0	K2-E00022A	81
3303		670794	INS	2	HOOK,HOOD RUBBER	UNKNOWN	0.0	0.0	0.0	K2-E00008A	50
3303		670794	REM	3	HOCK,HOOD,RUBBER	UNKNOWN	0.0	0.0	0.0	K2-E00022A	81
3303	NA	67D794	INS	3	LATCH,HOOD,VEHICULA	UNKNOWN	0.0	0.0	0.0	K2-E00077A	329
3303	NA	67D794	REM	3	LATCH,HOOD,VEHICULA	NA	0.0	0.0	0.0	K2-E00077B	334
3303		703HX	INS	2	WASHER,FLAT	UNKNOWN	0.0	0.0	0.0	K2-E00008A	50
3303		7C3HX	REM	2	WASHER,FLAT	UNKNOWN	0.0	0.0	0.0	K2-E00022A	81
3303	NA	AN365-1024A	REM	6	NUT,SELF-LOCKING,HE	NA	0.0	0.0	0.0	K2-E00077B	334
3303	NA	AN970-3	REM	6	WASHER,FLAT	NA	0.0	0.0	0.0	K2-E00077B	334
3303		E2800-24	INS	1	HEATER ASSEMBLY	UNKNOWN	0.0	0.0	0.0	K2-E00008A	50

SUPPLY SUPPORT CHART
CPT OF HEMTT, M978 TANKER
1-VG-120-HMT-028

ITEM# NPOF6Y

DATE 12/05/88
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GROUP#	POS CDE	PART NUMBER	ACT TAK	QTY	PART NOMENCLATURE	SERIAL#	PART LIFE MILES	MOTHRS	PTOHRS	TIR NO.	REC#
3303		E2800-24	REM	1	HEATER ASSEMBLY	UNKNOWN	0.0	0.0	0.0	K2-E00022A	81
3303	NA	E2800-24A	INS	1	HEATER,AIR DUCT,ENG	UNKNOWN	0.0	0.0	0.0	K2-E00077A	329
3303	NA	E2800-24A	REM	1	HEATER,AIR DUCT,ENG	NA	0.0	0.0	0.0	K2-E00077B	334
3303	NA	MS27183-10	INS	2	WASHER,FLAT	UNKNOWN	0.0	0.0	0.0	K2-E00077A	329
3303	NA	MS27183-10	INS	2	WASHER,FLAT	UNKNOWN	0.0	0.0	0.0	K2-E00077A	329
3303	NA	MS27183-10	REM	6	WASHER,FLAT	NA	0.0	0.0	0.0	K2-E00077B	334
3303	NA	MS27183-14	REM	8	WASHER,FLAT	NA	0.0	0.0	0.0	K2-E00077B	334
3303		MS35000-3	INS	3	BATTERY	UNKNOWN	0.0	0.0	0.0	K2-E00008A	50
3303		MS35000-3	REM	2	BATTERY	UNKNOWN	0.0	0.0	0.0	K2-E00022A	81
3303	NA	MS35000-3	INS	2	BATTERY,STORAGE	UNKNOWN	0.0	0.0	0.0	K2-E00077A	329
3303	NA	MS35000-3	REM	2	BATTERY,STORAGE	NA	0.0	0.0	0.0	K2-E00077B	334
3303	NA	MS35206-263	REM	6	SCREW,MACHINE	NA	0.0	0.0	0.0	K2-E00077B	334
3303		MS75004-1	INS	2	TERMINAL,BTRY PUS	UNKNOWN	0.0	0.0	0.0	K2-E00008A	50
3303		MS75004-1	REM	2	TERMINAL,BTRY PUS	UNKNOWN	0.0	0.0	0.0	K2-E00022A	81
3303	NA	MS75004-1	INS	2	TERMINAL,LUG	UNKNOWN	0.0	0.0	0.0	K2-E00077A	329
3303	NA	MS75004-1	REM	2	TERMINAL,LUG	NA	0.0	0.0	0.0	K2-E00077B	334
3303		MS75004-2	INS	2	TERMINAL,BTRY NEG	UNKNOWN	0.0	0.0	0.0	K2-E00008A	50
3303		MS75004-2	REM	2	TERMINAL,BTRY NEG	UNKNOWN	0.0	0.0	0.0	K2-E00022A	81
3303	NA	MS75004-2	INS	2	TERMINAL,LUG	UNKNOWN	0.0	0.0	0.0	K2-E00077A	329
3303	NA	MS75004-2	REM	2	TERMINAL,LUG	NA	0.0	0.0	0.0	K2-E00077B	334
4702		09480790	INS	2	PRESSURE GAUGE	UNKNOWN	0.0	0.0	0.0	K2-E00003-	7
4702		1000-0-160-1/4	REM	2	PRESSURE GAUGE	UNKNOWN	0.0	0.0	0.0	K2-E00003-	7
7202	NA	03H14A-HYD	REM	1	PUMP ASSY,SELF PRM	869640	3777.0	151.4	39.0	K2-E00059A	266
7202	NA	03H14A-HYD	INS	1	PUMP ASSY,SELF PRM	880574	3777.0	151.4	39.0	K2-E00059A	266
7202	NA	03H14A-HYD	REM	1	PUMP,CENTRIGUGAL	880574	3.0	0.4	1.1	K2-E00062A	282
7202	NA	03H14A-HYD	INS	1	PUMP,CENTRIFUGAL	902409	0.0	0.0	0.0	K2-E00062A	282
7202	NA	472475	CON	1	SEAL,GEAR OIL	UNKNOWN	11.0	0.7	0.9	K2-E00060A	268
7202	NA	8280-13045	CON	1	ELBOW,DISCHARGE	NA	3777.0	151.4	39.0	K2-E00059A	266
7202	NA	8280-13045	CON	1	ELBOW,FLANGE TO HOS	UNKNOWN	3.0	0.4	1.1	K2-E00062A	282
7202	NA	8849-13045	CON	1	FLANGE,SUCTION	NA	3777.0	151.4	39.0	K2-E00059A	266
7202	NA	8849-13045	CON	1	FLANGE,SUCTION	UNKNOWN	3.0	0.4	1.1	K2-E00062A	282
7202	NA	D1250-563-0500	CON	1	WASHER,SPRING TENSI	UNKNOWN	11.0	0.7	0.9	K2-E00060A	268
7202	NA	D1251-332-XF5017	CON	1	SEAL,MECHANICAL,ROT	UNKNOWN	11.0	0.7	0.9	K2-E00060A	268
7203	NA	10232C	CON	1	GASKET	UNKNOWN	2804.0	112.3	28.1	K2-E00049-	215
7203		15028V6	INS	1	RING, RETAINING	UNKNOWN	0.0	0.0	0.0	K2-E00013A	97
UNKN	NA	1367HX1	INS	3	SCREW,CAP,HEX	UNKNOWN	0.0	0.0	0.0	K2-E00077A	329

COMPACT SUPPORTABILITY ANALYSIS CHART DATE 12/02/88

COMBAT SYSTEMS TEST ACTIVITY APG MD. | PROJECT NUMBER 1-VG-120-HMT-028 | PROJECT NAME CPT OF HEMTT, M978 TANKER | ITEM-ID NPOF6Y

FUNCTIONAL GROUP	ACTION AND INCIDENT SUBJECT	MAINTENANCE LEVEL USED	PRESC	RECOM	MAINTENANCE HOURS	MIN	ITEM LIFE	
0000	NONE M978 HEMTT NPOF6Y	ORG	ORG	ORG	CLOCK 0	1	0.0 MILES	TIR#: K2-E00001-
					MAN 0	1	0.0 MOTHRS	INCIDENT DATE: 88/04/14
					DIAG-CLK 0	0	0.0 PTOHRS	FD/SC STEP: 01-
					DIAG-MAN 0	0	0.0 ENGHRS	FD/SC CLASS: NO TEST
								SUBSYSTEM: CHASSIS
								MAINT. TYPE/TIME: SCHED / NON-CHARGEABLE
								INCIDENT CLASS: INFORMATION
								CHARGEABILITY:
0000	SERVICE M978 HEMTT NPOF6Y	ORG	ORG	ORG	CLOCK 3	44	0.0 MILES	TIR#: K2-E00001A
					MAN 5	24	0.0 MOTHRS	INCIDENT DATE: 88/04/14
					DIAG-CLK 0	0	0.0 PTOHRS	FD/SC STEP: 01-
					DIAG-MAN 0	0	0.0 ENGHRS	FD/SC CLASS: NO TEST
								SUBSYSTEM: CHASSIS
								MAINT. TYPE/TIME: SCHED / NON-CHARGEABLE
								INCIDENT CLASS: INFORMATION
								CHARGEABILITY:
0000	NONE M978 HEMTT NPOF6Y	ORG	ORG	ORG	CLOCK 0	36	0.0 MILES	TIR#: K2-E00002-
					MAN 0	36	0.0 MOTHRS	INCIDENT DATE: 88/04/14
					DIAG-CLK 0	0	0.0 PTOHRS	FD/SC STEP: 02-
					DIAG-MAN 0	0	0.0 ENGHRS	FD/SC CLASS: NO TEST
								SUBSYSTEM: CHASSIS
								MAINT. TYPE/TIME: SCHED / NON-CHARGEABLE
								INCIDENT CLASS: INFORMATION
								CHARGEABILITY:
4702	REPLACE GAUGE,PRESSURE	ORG	ORG	ORG	CLOCK 0	10	0.0 MILES	TIR#: K2-E00003-
					MAN 0	10	0.0 MOTHRS	INCIDENT DATE: 88/04/14
					DIAG-CLK 0	0	0.0 PTOHRS	FD/SC STEP: 04-
					DIAG-MAN 0	0	0.0 ENGHRS	FD/SC CLASS: NO TEST
								SUBSYSTEM: ANCILLARY
								MAINT. TYPE/TIME: UNSCH / NON-CHARGEABLE
								INCIDENT CLASS: INFORMATION
								CHARGEABILITY:
2402	DIAGNOSE LEVER	CREW	CREW	CREW	CLOCK 0	0	0.0 MILES	TIR#: K2-E00004-
					MAN 0	0	0.0 MOTHRS	INCIDENT DATE: 88/04/20
					DIAG-CLK 0	0	0.0 PTOHRS	FD/SC STEP: 01-
					DIAG-MAN 0	0	0.0 ENGHRS	FD/SC CLASS: NO TEST
								SUBSYSTEM: ANCILLARY
								MAINT. TYPE/TIME: UNSCH / NON-CHARGEABLE
								INCIDENT CLASS: INFORMATION
								CHARGEABILITY:

COMPACT SUPPORTABILITY ANALYSIS CHART DATE 12/02/88

COMBAT SYSTEMS TEST ACTIVITY APG MD. | PROJECT NUMBER 1-VG-120-HMT-028 | PROJECT NAME CPT OF HEMTT, M978 TANKER | ITEM-ID NPOF6Y

FUNCTIONAL GROUP	ACTION AND INCIDENT SUBJECT	MAINTENANCE LEVEL USED	PRESC	RECOM	MAINTENANCE HOURS MIN		ITEM LIFE		
0000	NONE M978 HEMTT NPOF6Y	CREW	CREW	CREW	CLOCK 1 0 MAN 1 0 DIAG-CLK 1 0 DIAG-MAN 1 0		0.0 MILES 0.0 MOTHRS 0.0 PTOHRS 0.0 ENGHRS	TIR#: K2-E00005- INCIDENT DATE: 88/04/25 FD/SC STEP: 01- FD/SC CLASS: NO TEST SUBSYSTEM: CHASSIS MAINT. TYPE/TIME: UNSCH / NON-CHARGEABLE INCIDENT CLASS: INFORMATION CHARGEABILITY:	
0000	NONE M978 HEMTT NPOF6Y	CREW	CREW	CREW	CLOCK 0 0 MAN 0 0 DIAG-CLK 0 0 DIAG-MAN 0 0		0.0 MILES 0.0 MOTHRS 0.0 PTOHRS 0.0 ENGHRS	TIR#: K2-E00005A INCIDENT DATE: 88/04/25 FD/SC STEP: 01- FD/SC CLASS: NO TEST SUBSYSTEM: CHASSIS MAINT. TYPE/TIME: UNSCH / NON-CHARGEABLE INCIDENT CLASS: INFORMATION CHARGEABILITY:	
0000	NONE M978 HEMTT NPOF6Y	CREW	CREW	CREW	CLOCK 0 0 MAN 0 0 DIAG-CLK 0 0 DIAG-MAN 0 0		0.0 MILES 0.0 MOTHRS 0.0 PTOHRS 0.0 ENGHRS	TIR#: K2-E00006- INCIDENT DATE: 88/04/25 FD/SC STEP: 01- FD/SC CLASS: NO TEST SUBSYSTEM: CHASSIS MAINT. TYPE/TIME: UNSCH / NON-CHARGEABLE INCIDENT CLASS: INFORMATION CHARGEABILITY:	
0000	NONE M978 HEMTT NPOF6Y	CREW	CREW	CREW	CLOCK 0 0 MAN 0 0 DIAG-CLK 0 0 DIAG-MAN 0 0		0.0 MILES 0.0 MOTHRS 0.0 PTOHRS 0.0 ENGHRS	TIR#: K2-E00006A INCIDENT DATE: 88/04/25 FD/SC STEP: 01- FD/SC CLASS: NO TEST SUBSYSTEM: CHASSIS MAINT. TYPE/TIME: UNSCH / NON-CHARGEABLE INCIDENT CLASS: INFORMATION CHARGEABILITY:	
0608	REPLACE FLASHER,SIGNAL	ORG	ORG	ORG	CLOCK 0 41 MAN 0 41 DIAG-CLK 0 28 DIAG-MAN 0 28		0.0 MILES 0.0 MOTHRS 0.0 PTOHRS 0.0 ENGHRS	TIR#: K2-E00007- INCIDENT DATE: 88/04/25 FD/SC STEP: 01- FD/SC CLASS: NO TEST SUBSYSTEM: CHASSIS MAINT. TYPE/TIME: UNSCH / NON-CHARGEABLE INCIDENT CLASS: MINOR CHARGEABILITY:	

COMPACT SUPPORTABILITY ANALYSIS CHART DATE 12/02/88

COMBAT SYSTEMS TEST ACTIVITY APG MD. | PROJECT NUMBER 1-VG-120-HMT-028 | PROJECT NAME CPT OF HEMTT, M978 TANKER | ITEM-ID NPOF6Y

FUNCTIONAL GROUP	ACTION AND INCIDENT SUBJECT	MAINTENANCE USED	LEVEL PRESC	LEVEL RECOM	MAINTENANCE HOURS	MIN	ITEM LIFE		
0000	NONE M978HEMTT NPOF6Y	ORG	ORG	ORG	CLOCK 0	1	0.0 MILES	TIR#:	K2-E00008-
					MAN 0	1	0.0 MOTHRS	INCIDENT DATE:	88/05/02
					DIAG-CLK 0	0	0.0 PTOHRS	FD/SC STEP:	01-
					DIAG-MAN 0	0	0.0 ENGHRS	FD/SC CLASS:	NO TEST
								SUBSYSTEM:	CHASSIS
								MAINT. TYPE/TIME:	UNSCH / NON-CHARGEABLE
								INCIDENT CLASS:	INFORMATION
								CHARGEABILITY:	
0000	SERVICE M978 HEMTT NPOF6Y	ORG	ORG	ORG	CLOCK 12	4	0.0 MILES	TIR#:	K2-E00008A
					MAN 17	14	0.0 MOTHRS	INCIDENT DATE:	88/05/02
					DIAG-CLK 0	0	0.0 PTOHRS	FD/SC STEP:	01-
					DIAG-MAN 0	0	0.0 ENGHRS	FD/SC CLASS:	NO TEST
								SUBSYSTEM:	CHASSIS
								MAINT. TYPE/TIME:	UNSCH / NON-CHARGEABLE
								INCIDENT CLASS:	INFORMATION
								CHARGEABILITY:	
0311	REPLACE CYLINDER	ORG	ORG	ORG	CLOCK 0	7	0.0 MILES	TIR#:	K2-E00009-
					MAN 0	7	0.0 MOTHRS	INCIDENT DATE:	88/05/03
					DIAG-CLK 0	1	0.0 PTOHRS	FD/SC STEP:	01-
					DIAG-MAN 0	1	0.0 ENGHRS	FD/SC CLASS:	NO TEST
								SUBSYSTEM:	CHASSIS
								MAINT. TYPE/TIME:	UNSCH / NON-CHARGEABLE
								INCIDENT CLASS:	INFORMATION
								CHARGEABILITY:	
0000	NONE M978 HEMTT NPOF6Y	CREW	CREW	CREW	CLOCK 0	0	0.0 MILES	TIR#:	K2-E00010-
					MAN 0	0	0.0 MOTHRS	INCIDENT DATE:	88/05/05
					DIAG-CLK 0	0	0.0 PTOHRS	FD/SC STEP:	01-
					DIAG-MAN 0	0	0.0 ENGHRS	FD/SC CLASS:	NO TEST
								SUBSYSTEM:	CHASSIS
								MAINT. TYPE/TIME:	UNSCH / NON-CHARGEABLE
								INCIDENT CLASS:	INFORMATION
								CHARGEABILITY:	
00 0	NONE M978 HEMTT NPOF6Y	ORG	ORG	ORG	CLOCK 0	1	0.0 MILES	TIR#:	K2-E00010A
					MAN 0	1	0.0 MOTHRS	INCIDENT DATE:	88/05/05
					DIAG-CLK 0	0	0.0 PTOHRS	FD/SC STEP:	01-
					DIAG-MAN 0	0	0.0 ENGHRS	FD/SC CLASS:	NO TEST
								SUBSYSTEM:	CHASSIS
								MAINT. TYPE/TIME:	UNSCH / NON-CHARGEABLE
								INCIDENT CLASS:	INFORMATION
								CHARGEABILITY:	

COMPACT SUPPORTABILITY ANALYSIS CHART DATE 12/02/88

COMBAT SYSTEMS TEST ACTIVITY APG MD. | PROJECT NUMBER 1-VG-120-HMT-028 | PROJECT NAME CPT OF HEMTT, M978 TANKER | ITEM-ID NPOF6Y

FUNCTIONAL GROUP	ACTION AND INCIDENT SUBJECT	MAINTENANCE LEVEL USED	PRESC	RECOM	MAINTENANCE HOURS	MIN	ITEM LIFE	
0609	DIAGNOSE LAMP ASSY,CABINET	CREW	CREW	CREW	CLOCK	0	0	0.0 MILES
					MAN	0	0	0.0 MOTHRS
					DIAG-CLK	0	0	0.0 PTOHRS
					DIAG-MAN	0	0	0.0 ENGHRS
0609	NONE LAMP ASSY, CABINET	CREW	CREW	CREW	CLOCK	0	0	0.0 MILES
					MAN	0	0	0.0 MOTHRS
					DIAG-CLK	0	0	0.0 PTOHRS
					DIAG-MAN	0	0	0.0 ENGHRS
2202	REPLACE HOSE,TWIN	ORG	ORG	ORG	CLOCK	0	7	0.0 MILES
					MAN	0	11	0.0 MOTHRS
					DIAG-CLK	0	3	0.0 PTOHRS
					DIAG-MAN	0	3	0.0 ENGHRS
7203	DIAGNOSE VALVE, AIR ACTUATED	CREW	CREW	CREW	CLOCK	0	0	0.0 MILES
					MAN	0	0	0.0 MOTHRS
					DIAG-CLK	0	0	0.0 PTOHRS
					DIAG-MAN	0	0	0.0 ENGHRS
7203	ADJUST VALVE, BUTTERFLY	DS	DS	DS	CLOCK	9	2	0.0 MILES
					MAN	9	2	0.0 MOTHRS
					DIAG-CLK	1	30	0.0 PTOHRS
					DIAG-MAN	1	30	0.0 ENGHRS

TIR#:	K2-E00011-	
INCIDENT DATE:	88/05/06	
FD/SC STEP:	01-	
FD/SC CLASS:	NO TEST	
SUBSYSTEM:	ANCILLARY	
MAINT. TYPE/TIME:	UNSCH /	NON-CHARGEABLE
INCIDENT CLASS:	MINOR	
CHARGEABILITY:		
TIR#:	K2-E00011A	
INCIDENT DATE:	88/05/06	
FD/SC STEP:	01-	
FD/SC CLASS:	NO TEST	
SUBSYSTEM:	ANCILLARY	
MAINT. TYPE/TIME:	UNSCH /	NON-CHARGEABLE
INCIDENT CLASS:	INFORMATION	
CHARGEABILITY:		
TIR#:	K2-E00012-	
INCIDENT DATE:	88/05/06	
FD/SC STEP:	01-	
FD/SC CLASS:	NO TEST	
SUBSYSTEM:	ANCILLARY	
MAINT. TYPE/TIME:	UNSCH /	NON-CHARGEABLE
INCIDENT CLASS:	MINOR	
CHARGEABILITY:		
TIR#:	K2-E00013-	
INCIDENT DATE:	88/05/09	
FD/SC STEP:	01-	
FD/SC CLASS:	NO TEST	
SUBSYSTEM:	ANCILLARY	
MAINT. TYPE/TIME:	UNSCH /	NON-CHARGEABLE
INCIDENT CLASS:	MINOR	
CHARGEABILITY:		
TIR#:	K2-E00013A	
INCIDENT DATE:	88/05/19	
FD/SC STEP:	01-	
FD/SC CLASS:	NO TEST	
SUBSYSTEM:	ANCILLARY	
MAINT. TYPE/TIME:	UNSCH /	NON-CHARGEABLE
INCIDENT CLASS:	MINOR	
CHARGEABILITY:		

COMPACT SUPPORTABILITY ANALYSIS CHART DATE 12/02/88

COMBAT SYSTEMS TEST ACTIVITY APG MD. | PROJECT NUMBER 1-VG-120-HMT-028 | PROJECT NAME CPT OF HEMTT, M978 TANKER | ITEM-ID NPOF6Y

FUNCTIONAL GROUP	ACTION AND INCIDENT SUBJECT	MAINTENANCE USED	LEVEL PRESC	RECOM	MAINTENANCE HOURS	MIN	ITEM LIFE		
0000	NONE NOZZLE, D-1	ORG	ORG	ORG	CLOCK 0 MAN 0 DIAG-CLK 0 DIAG-MAN 0	13 13 13 13	0.0 MILES 0.0 MOTHRS 0.0 PTOHRS 0.0 ENGHRS	TIR#: K2-E00014- INCIDENT DATE: 88/05/06 FD/SC STEP: 01- FD/SC CLASS: NO TEST SUBSYSTEM: ANCILLARY MAINT. TYPE/TIME: UNSCH / NON-CHARGEABLE INCIDENT CLASS: MINOR CHARGEABILITY:	
0000	NONE NOZZLE, D1	ORG	ORG	ORG	CLOCK 0 MAN 0 DIAG-CLK 0 DIAG-MAN 0	0 0 0 0	0.0 MILES 0.0 MOTHRS 0.0 PTOHRS 0.0 ENGHRS	TIR#: K2-E00014A INCIDENT DATE: 88/05/06 FD/SC STEP: 01- FD/SC CLASS: NO TEST SUBSYSTEM: ANCILLARY MAINT. TYPE/TIME: UNSCH / NON-CHARGEABLE INCIDENT CLASS: INFORMATION CHARGEABILITY:	
0100	NONE ENGINE,BASIC MODEL	CREW	CREW	CREW	CLOCK 0 MAN 0 DIAG-CLK 0 DIAG-MAN 0	0 0 0 0	0.0 MILES 0.0 MOTHRS 0.0 PTOHRS 0.0 ENGHRS	TIR#: K2-E00015- INCIDENT DATE: 88/05/11 FD/SC STEP: 01- FD/SC CLASS: NO TEST SUBSYSTEM: CHASSIS MAINT. TYPE/TIME: UNSCH / NON-CHARGEABLE INCIDENT CLASS: MAJOR CHARGEABILITY:	
0100	REPLACE SEAL,PLAIN	DS	DS	DS	CLOCK 4 MAN 5 DIAG-CLK 0 DIAG-MAN 0	52 42 0 0	0.0 MILES 0.0 MOTHRS 0.0 PTOHRS 0.0 ENGHRS	TIR#: K2-E00015A INCIDENT DATE: 88/05/11 FD/SC STEP: 01- FD/SC CLASS: NO TEST SUBSYSTEM: CHASSIS MAINT. TYPE/TIME: UNSCH / NON-CHARGEABLE INCIDENT CLASS: INFORMATION CHARGEABILITY:	
0000	DIAGNOSE NOZZLE, D1	ORG	ORG	ORG	CLOCK 0 MAN 0 DIAG-CLK 0 DIAG-MAN 0	1 1 1 1	0.0 MILES 0.0 MOTHRS 0.0 PTOHRS 0.0 ENGHRS	TIR#: K2-E00016- INCIDENT DATE: 88/05/12 FD/SC STEP: 01- FD/SC CLASS: NO TEST SUBSYSTEM: ANCILLARY MAINT. TYPE/TIME: UNSCH / NON-CHARGEABLE INCIDENT CLASS: MAJOR CHARGEABILITY:	

COMPACT SUPPORTABILITY ANALYSIS CHART DATE 12/02/88

COMBAT SYSTEMS TEST ACTIVITY APG MD. | PROJECT NUMBER 1-VG-120-HMT-028 | PROJECT NAME CPT OF HEMTT, M978 TANKER | ITEM-ID NPOF6Y

FUNCTIONAL GROUP	ACTION AND INCIDENT SUBJECT	MAINTENANCE USED	LEVEL PRESC	RECOM	MAINTENANCE HOURS	MIN	ITEM LIFE		
0000	REPLACE NOZZLE,D1	ORG	ORG	ORG	CLOCK	0	1	0.0 MILES	TIR#: K2-E00016A
					MAN	0	1	0.0 MOTHRS	INCIDENT DATE: 88/05/12
					DIAG-CLK	0	0	0.0 PTOHRS	FD/SC STEP: 01-
					DIAG-MAN	0	0	0.0 ENGHRS	FD/SC CLASS: NO TEST
									SUBSYSTEM: ANCILLARY
									MAINT. TYPE/TIME: UNSCH / NON-CHARGEABLE
									INCIDENT CLASS: INFORMATION
									CHARGEABILITY:
0721	ADJUST FILTER FLUID	ORG	ORG	ORG	CLOCK	0	8	0.0 MILES	TIR#: K2-E00017-
					MAN	0	8	0.0 MOTHRS	INCIDENT DATE: 88/05/14
					DIAG-CLK	0	3	0.0 PTOHRS	FD/SC STEP: 01-
					DIAG-MAN	0	3	0.0 ENGHRS	FD/SC CLASS: NO TEST
									SUBSYSTEM: CHASSIS
									MAINT. TYPE/TIME: UNSCH / NON-CHARGEABLE
									INCIDENT CLASS: MINOR
									CHARGEABILITY:
0607	DIAGNOSE LIGHT,WARNING,RED	CREW	CREW	CREW	CLOCK	0	0	0.0 MILES	TIR#: K2-E00018-
					MAN	0	0	0.0 MOTHRS	INCIDENT DATE: 88/05/14
					DIAG-CLK	0	0	0.0 PTOHRS	FD/SC STEP: 01-
					DIAG-MAN	0	0	0.0 ENGHRS	FD/SC CLASS: NO TEST
									SUBSYSTEM: CHASSIS
									MAINT. TYPE/TIME: UNSCH / NON-CHARGEABLE
									INCIDENT CLASS: MINOR
									CHARGEABILITY:
0607	DIAGNOSE LIGHT,WARNING	ORG	ORG	ORG	CLOCK	0	2	0.0 MILES	TIR#: K2-E00018A
					MAN	0	2	0.0 MOTHRS	INCIDENT DATE: 88/05/14
					DIAG-CLK	0	0	0.0 PTOHRS	FD/SC STEP: 01-
					DIAG-MAN	0	0	0.0 ENGHRS	FD/SC CLASS: NO TEST
									SUBSYSTEM: CHASSIS
									MAINT. TYPE/TIME: UNSCH / NON-CHARGEABLE
									INCIDENT CLASS: INFORMATION
									CHARGEABILITY:
2202	NONE VALVE,THREE WAY AIR	CREW	CREW	CREW	CLOCK	0	0	0.0 MILES	TIR#: K2-E00019-
					MAN	0	0	0.0 MOTHRS	INCIDENT DATE: 88/05/14
					DIAG-CLK	0	0	0.0 PTOHRS	FD/SC STEP: 01-
					DIAG-MAN	0	0	0.0 ENGHRS	FD/SC CLASS: NO TEST
									SUBSYSTEM: ANCILLARY
									MAINT. TYPE/TIME: UNSCH / NON-CHARGEABLE
									INCIDENT CLASS: MAJOR
									CHARGEABILITY:

COMPACT SUPPORTABILITY ANALYSIS CHART DATE 12/02/88

COMBAT SYSTEMS TEST ACTIVITY APG MD. | PROJECT NUMBER 1-VG-120-HMT-028 | PROJECT NAME CPT OF HEMTT, M978 TANKER | ITEM-ID NPOF6Y

FUNCTIONAL GROUP	ACTION AND INCIDENT SUBJECT	MAINTENANCE LEVEL USED	PRESC	RECOM	MAINTENANCE HOURS	MIN	ITEM LIFE		
2202	NONE VALVE, THREE WAY AIR	ORG	ORG	ORG	CLOCK MAN DIAG-CLK DIAG-MAN	0 0 0 0	5 5 0 0	0.0 MILES 0.0 MOTHRS 0.0 PTOHRS 0.0 ENGHRS	TIR#: K2-E00019A INCIDENT DATE: 88/05/14 FD/SC STEP: 01- FD/SC CLASS: NO TEST SUBSYSTEM: ANCILLARY MAINT. TYPE/TIME: UNSCH / NON-CHARGEABLE INCIDENT CLASS: INFORMATION CHARGEABILITY:
0607	NONE SWITCH, TOGGLE	CREW	CREW	CREW	CLOCK MAN DIAG-CLK DIAG-MAN	0 0 0 0	5 5 2 2	0.0 MILES 0.0 MOTHRS 0.0 PTOHRS 0.0 ENGHRS	TIR#: K2-E00020- INCIDENT DATE: 88/05/14 FD/SC STEP: 01- FD/SC CLASS: NO TEST SUBSYSTEM: CHASSIS MAINT. TYPE/TIME: UNSCH / NON-CHARGEABLE INCIDENT CLASS: MINOR CHARGEABILITY:
0607	REPLACE SWITCH, TOGGLE	ORG	ORG	ORG	CLOCK MAN DIAG-CLK DIAG-MAN	0 0 0 0	13 13 0 0	0.0 MILES 0.0 MOTHRS 0.0 PTOHRS 0.0 ENGHRS	TIR#: K2-E00020A INCIDENT DATE: 88/05/14 FD/SC STEP: 01- FD/SC CLASS: NO TEST SUBSYSTEM: CHASSIS MAINT. TYPE/TIME: UNSCH / NON-CHARGEABLE INCIDENT CLASS: INFORMATION CHARGEABILITY:
0607	DIAGNOSE GAUGE,OIL PRESSURE	CREW	CREW	CREW	CLOCK MAN DIAG-CLK DIAG-MAN	0 0 0 0	4 4 4 4	0.0 MILES 0.0 MOTHRS 0.0 PTOHRS 0.0 ENGHRS	TIR#: K2-E00021- INCIDENT DATE: 88/05/14 FD/SC STEP: 01- FD/SC CLASS: NO TEST SUBSYSTEM: CHASSIS MAINT. TYPE/TIME: UNSCH / NON-CHARGEABLE INCIDENT CLASS: MINOR CHARGEABILITY:
0607	DIAGNOSE PRESSURE INDICATOR	ORG	ORG	ORG	CLOCK MAN DIAG-CLK DIAG-MAN	0 0 0 0	1 1 0 0	0.0 MILES 0.0 MOTHRS 0.0 PTOHRS 0.0 ENGHRS	TIR#: K2-E00021A INCIDENT DATE: 88/05/14 FD/SC STEP: 01- FD/SC CLASS: NO TEST SUBSYSTEM: CHASSIS MAINT. TYPE/TIME: UNSCH / NON-CHARGEABLE INCIDENT CLASS: INFORMATION CHARGEABILITY:

COMPACT SUPPORTABILITY ANALYSIS CHART DATE 12/02/88

COMBAT SYSTEMS TEST ACTIVITY APG MD. | PROJECT NUMBER 1-VG-120-HMT-028 | PROJECT NAME CPT OF HEMTT, M978 TANKER | ITEM-IO NPOF6Y

FUNCTIONAL GROUP	ACTION AND INCIDENT SUBJECT	MAINTENANCE USED	LEVEL PRESC	LEVEL RECOM	MAINTENANCE HOURS	MIN	ITEM LIFE	
0000	NONE M978 HEMTT NPOF6Y	CREW	CREW	CREW	CLOCK 0 MAN 0 DIAG-CLK 0 DIAG-MAN 0	0 0 0 0	0.0 MILES 0.0 MOTHRS 0.0 PTOHRS 0.0 ENGHRS	TIR#: K2-E00022- INCIDENT DATE: 88/05/16 FD/SC STEP: 01- FO/SC CLASS: NO TEST SUBSYSTEM: CHASSIS MAINT. TYPE/TIME: UNSCH / NON-CHARGEABLE INCIDENT CLASS: INFORMATION CHARGEABILITY:
0000	SERVICE M978 HEMTT NPOF6Y	ORG	ORG	ORG	CLOCK 5 MAN 7 DIAG-CLK 0 DIAG-MAN 0	31 44 0 0	0.0 MILES 0.0 MOTHRS 0.0 PTOHRS 0.0 ENGHRS	TIR#: K2-E00022A INCIDENT DATE: 88/05/16 FD/SC STEP: 01- FO/SC CLASS: NO TEST SUBSYSTEM: CHASSIS MAINT. TYPE/TIME: UNSCH / NON-CHARGEABLE INCIDENT CLASS: INFORMATION CHARGEABILITY:
1604	NONE SHOCK ABSORBER	ORG	ORG	ORG	CLOCK 0 MAN 0 DIAG-CLK 0 DIAG-MAN 0	12 12 5 5	0.0 MILES 0.0 MOTHRS 0.0 PTOHRS 0.0 ENGHRS	TIR#: K2-E00023- INCIDENT DATE: 88/05/17 FD/SC STEP: 01- FO/SC CLASS: NO TEST SUBSYSTEM: CHASSIS MAINT. TYPE/TIME: UNSCH / NON-CHARGEABLE INCIDENT CLASS: MINOR CHARGEABILITY:
0612	REPLACE BATTERY	ORG	ORG	ORG	CLOCK 0 MAN 0 DIAG-CLK 0 DIAG-MAN 0	8 8 2 2	0.0 MILES 0.0 MOTHRS 0.0 PTOHRS 0.0 ENGHRS	TIR#: K2-E00024- INCIDENT DATE: 88/05/17 FD/SC STEP: 01- FO/SC CLASS: NO TEST SUBSYSTEM: CHASSIS MAINT. TYPE/TIME: UNSCH / NON-CHARGEABLE INCIDENT CLASS: MINOR CHARGEABILITY:
0505	NONE BELT,VEE,MATCHED SET	ORG	ORG	ORG	CLOCK 0 MAN 0 DIAG-CLK 0 DIAG-MAN 0	1 1 1 1	0.0 MILES 0.0 MOTHRS 0.0 PTOHRS 0.0 ENGHRS	TIR#: K2-E00025- INCIDENT DATE: 88/05/18 FD/SC STEP: 01- FO/SC CLASS: NO TEST SUBSYSTEM: CHASSIS MAINT. TYPE/TIME: UNSCH / NON-CHARGEABLE INCIDENT CLASS: MINOR CHARGEABILITY:

COMPACT SUPPORTABILITY ANALYSIS CHART DATE 12/D2/88

COMBAT SYSTEMS TEST ACTIVITY APG MD. | PROJECT NUMBER 1-VG-120-HMT-028 | PROJECT NAME CPT OF HEMTT, M978 TANKER | ITEM-ID NPOF6Y

FUNCTIONAL GROUP	ACTION AND INCIDENT SUBJECT	MAINTENANCE USED	LEVEL PRESC	LEVEL RECOM	MAINTENANCE HOURS	MIN	ITEM LIFE		
0505	REPLACE BELT, VEE	ORG	ORG	ORG	CLOCK	0 12	0.0	MILES	TIR#: K2-E00025A
					MAN	0 12	0.D	MOTHRS	INCIDENT DATE: 88/05/18
					DIAG-CLK	D 0	D.0	PTOHRS	FD/SC STEP: 01-
					DIAG-MAN	0 0	0.0	ENGHRS	FD/SC CLASS: NO TEST
									SUBSYSTEM: CHASSIS
									MAINT. TYPE/TIME: UNSCH / NON-CHARGEABLE
									INCIDENT CLASS: INFORMATION
									CHARGEABILITY:
D90D	DIAGNOSE JOURNAL, SUBASSEMBLY	ORG	ORG	ORG	CLOCK	D 22	0.0	MILES	TIR#: K2-E00026-
					MAN	0 22	0.D	MOTHRS	INCIDENT DATE: 88/06/02
					DIAG-CLK	0 4	0.0	PTOHRS	FD/SC STEP: 01-
					DIAG-MAN	0 4	0.0	ENGHRS	FD/SC CLASS: NO TEST
									SUBSYSTEM: CHASSIS
									MAINT. TYPE/TIME: UNSCH / NON-CHARGEABLE
									INCIDENT CLASS: MAJOR
									CHARGEABILITY:
0900	REPLACE PROPELLER SHAFT	ORG	ORG	ORG	CLOCK	D 35	D.D	MILES	TIR#: K2-ED0026A
					MAN	0 55	0.D	MOTHRS	INCIDENT DATE: 88/06/03
					DIAG-CLK	0 0	D.0	PTOHRS	FD/SC STEP: 01-
					DIAG-MAN	0 0	0.0	ENGHRS	FD/SC CLASS: NO TEST
									SUBSYSTEM: CHASSIS
									MAINT. TYPE/TIME: UNSCH / NON-CHARGEABLE
									INCIDENT CLASS: INFORMATION
									CHARGEABILITY:
0801	REPLACE YOKE,UNIVERSAL JOIN	DS	DS	DS	CLOCK	D 32	D.D	MILES	TIR#: K2-E00026B
					MAN	0 32	D.D	MOTHRS	INCIDENT DATE: 88/D6/03
					DIAG-CLK	0 1	D.D	PTOHRS	FD/SC STEP: D1-
					DIAG-MAN	D 1	0.D	ENGHRS	FD/SC CLASS: NO TEST
									SUBSYSTEM: CHASSIS
									MAINT. TYPE/TIME: UNSCH / NON-CHARGEABLE
									INCIDENT CLASS: INFORMATION
									CHARGEABILITY:
D00D	NONE M978 HEMTT NPOF6Y	CREW	CREW	CREW	CLOCK	0 0	0.0	MILES	TIR#: K2-E00027-
					MAN	D 0	D.0	MOTHRS	INCIDENT DATE: 88/D6/1D
					DIAG-CLK	D D	0.D	PTOHRS	FD/SC STEP: 01-
					DIAG-MAN	D 0	0.0	ENGHRS	FD/SC CLASS: NO TEST
									SUBSYSTEM: CHASSIS
									MAINT. TYPE/TIME: UNSCH / NON-CHARGEABLE
									INCIDENT CLASS: INFORMATION
									CHARGEABILITY:

COMPACT SUPPORTABILITY ANALYSIS CHART DATE 12/02/88

COMBAT SYSTEMS TEST ACTIVITY APG MD. | PROJECT NUMBER 1-VG-120-HMT-028 | PROJECT NAME CPT OF HEMTT, M978 TANKER | ITEM-ID NPOF6Y

FUNCTIONAL GROUP	ACTION AND INCIDENT SUBJECT	MAINTENANCE LEVEL USED	PRESC	RECOM	MAINTENANCE HOURS	MIN	ITEM LIFE		
0000	NONE M978 HEMTT NPOF6Y	CREW	CREW	CREW	CLOCK 0 MAN 0 DIAG-CLK 0 DIAG-MAN 0	0 0 0 0	0.0 MILES 0.0 MOTHRS 0.0 PTOHRS 0.0 ENGHRS	TIR#: K2-E00028- INCIDENT DATE: 88/06/10 FD/SC STEP: 01- FD/SC CLASS: NO TEST SUBSYSTEM: CHASSIS MAINT. TYPE/TIME: UNSCH / NON-CHARGEABLE INCIDENT CLASS: INFORMATION CHARGEABILITY:	
0000	NONE M978 HEMTT NPOF6Y	CREW	CREW	CREW	CLOCK 0 MAN 0 DIAG-CLK 0 DIAG-MAN 0	0 0 0 0	0.0 MILES 0.0 MOTHRS 0.0 PTOHRS 0.0 ENGHRS	TIR#: K2-E00029- INCIDENT DATE: 88/06/10 FD/SC STEP: 01- FD/SC CLASS: NO TEST SUBSYSTEM: CHASSIS MAINT. TYPE/TIME: UNSCH / NON-CHARGEABLE INCIDENT CLASS: INFORMATION CHARGEABILITY:	
0000	NONE M978 HEMTT NPO6FY	CREW	CREW	CREW	CLOCK 0 MAN 0 DIAG-CLK 0 DIAG-MAN 0	0 0 0 0	0.0 MILES 0.0 MOTHRS 0.0 PTOHRS 0.0 ENGHRS	TIR#: K2-E00030- INCIDENT DATE: 88/06/10 FD/SC STEP: 01- FD/SC CLASS: NO TEST SUBSYSTEM: CHASSIS MAINT. TYPE/TIME: UNSCH / NON-CHARGEABLE INCIDENT CLASS: INFORMATION CHARGEABILITY:	
0610	NONE GAGE	CREW	CREW	CREW	CLOCK 0 MAN 0 DIAG-CLK 0 DIAG-MAN 0	0 0 0 0	0.0 MILES 0.0 MOTHRS 0.0 PTOHRS 0.0 ENGHRS	TIR#: K2-E00031- INCIDENT DATE: 88/06/15 FD/SC STEP: 01- FD/SC CLASS: NO TEST SUBSYSTEM: CHASSIS MAINT. TYPE/TIME: UNSCH / NON-CHARGEABLE INCIDENT CLASS: MINOR CHARGEABILITY:	
0610	ADJUST PROBE, FUEL LEVEL	ORG	ORG	ORG	CLOCK 0 MAN 0 DIAG-CLK 0 DIAG-MAN 0	50 50 10 10	0.0 MILES 0.0 MOTHRS 0.0 PTOHRS 0.0 ENGHRS	TIR#: K2-E00031A INCIDENT DATE: 88/06/15 FD/SC STEP: 01- FD/SC CLASS: NO TEST SUBSYSTEM: ANCILLARY MAINT. TYPE/TIME: UNSCH / NON-CHARGEABLE INCIDENT CLASS: INFORMATION CHARGEABILITY:	

COMPACT SUPPORTABILITY ANALYSIS CHART DATE 12/02/88

COMBAT SYSTEMS TEST ACTIVITY APG MD. | PROJECT NUMBER 1-VG-120-HMT-028 | PROJECT NAME CPT OF HEMTT, M978 TANKER | ITEM-ID NPOF6Y

FUNCTIONAL GROUP	ACTION AND INCIDENT SUBJECT	MAINTENANCE LEVEL USED	PRESC	RECOM	MAINTENANCE HOURS	MIN	ITEM LIFE		
1202	ADJUST ADJUSTER,SLACK,BRAK	ORG	ORG	ORG	CLOCK MAN DIAG-CLK DIAG-MAN	0 0 0 0	20 20 0 0	0.0 MILES 0.0 MOTHRS 0.0 PTOHRS 0.0 ENGHRS	TIR#: K2-E00032- INCIDENT DATE: 88/06/16 FD/SC STEP: 01- FD/SC CLASS: NO TEST SUBSYSTEM: CHASSIS MAINT. TYPE/TIME: UNSCH / NON-CHARGEABLE INCIDENT CLASS: MINOR CHARGEABILITY:
2001	NONE SHAFT STRAIGHT	ORG	ORG	ORG	CLOCK MAN DIAG-CLK DIAG-MAN	0 0 0 D	11 11 1 1	0.D MILES 0.0 MOTHRS 0.0 PTOHRS D.D ENGHRS	TIR#: K2-E00033- INCIDENT DATE: 88/06/22 FD/SC STEP: 01- FD/SC CLASS: NO TEST SUBSYSTEM: CHASSIS MAINT. TYPE/TIME: UNSCH / NON-CHARGEABLE INCIDENT CLASS: MINOR CHARGEABILITY:
2001	REPLACE SHAFT,STRAIGHT	ORG	ORG	ORG	CLOCK MAN DIAG-CLK DIAG-MAN	0 0 D 0	10 10 D 0	0.0 MILES 0.0 MOTHRS 0.0 PTOHRS 0.0 ENGHRS	TIR#: K2-E00033A INCIDENT DATE: 88/06/22 FD/SC STEP: 01- FD/SC CLASS: NO TEST SUBSYSTEM: CHASSIS MAINT. TYPE/TIME: UNSCH / NON-CHARGEABLE INCIDENT CLASS: INFORMATION CHARGEABILITY:
0607	NONE INDICATOR, ELECTRICA	CREW	CREW	CREW	CLOCK MAN DIAG-CLK DIAG-MAN	0 0 0 0	1 1 1 1	0.0 MILES 0.0 MOTHRS 0.0 PTOHRS 0.0 ENGHRS	TIR#: K2-E00034- INCIDENT DATE: 88/06/21 FD/SC STEP: 01- FD/SC CLASS: NO TEST SUBSYSTEM: CHASSIS MAINT. TYPE/TIME: UNSCH / NON-CHARGEABLE INCIDENT CLASS: MINOR CHARGEABILITY:
0607	NONE INDICATOR,ELECTRICA	CREW	CREW	CREW	CLOCK MAN DIAG-CLK DIAG-MAN	0 0 0 0	10 10 10 10	0.0 MILES 0.0 MOTHRS 0.0 PTOHRS 0.0 ENGHRS	TIR#: K2-E00034A INCIDENT DATE: 88/06/21 FD/SC STEP: 01- FD/SC CLASS: NO TEST SUBSYSTEM: CHASSIS MAINT. TYPE/TIME: UNSCH / NON-CHARGEABLE INCIDENT CLASS: INFORMATION CHARGEABILITY:

COMPACT SUPPORTABILITY ANALYSIS CHART DATE 12/02/88

COMBAT SYSTEMS TEST ACTIVITY APG MD. | PROJECT NUMBER 1-VG-120-HMT-028 | PROJECT NAME CPT OF HEMTT, M978 TANKER | ITEM-ID NPOF6Y

FUNCTIONAL GROUP	ACTION AND INCIDENT SUBJECT	MAINTENANCE USED	LEVEL PRESC	RECOM		MAINTENANCE HOURS	MIN	ITEM LIFE		
1802	INSTALL BOLT,SELF-LOCKING	ORG	ORG	ORG	CLOCK	0	3	0.0	MILES	TIR#: K2-E00035-
					MAN	0	3	0.0	MOTHRS	INCIDENT DATE: 88/06/23
					DIAG-CLK	0	1	0.0	PTOHRS	FD/SC STEP: 01-
					DIAG-MAN	0	1	0.0	ENGHRS	FD/SC CLASS: NO TEST
										SUBSYSTEM: CHASSIS
										MAINT. TYPE/TIME: UNSCH / NON-CHARGEABLE
										INCIDENT CLASS: MINOR
										CHARGEABILITY:
1504	INSTALL STRAP,WEBBING	ORG	ORG	ORG	CLOCK	0	6	0.0	MILES	TIR#: K2-E00036-
					MAN	0	6	0.0	MOTHRS	INCIDENT DATE: 88/06/23
					DIAG-CLK	0	1	0.0	PTOHRS	FD/SC STEP: 01-
					DIAG-MAN	0	1	0.0	ENGHRS	FD/SC CLASS: NO TEST
										SUBSYSTEM: CHASSIS
										MAINT. TYPE/TIME: UNSCH / NON-CHARGEABLE
										INCIDENT CLASS: MINOR
										CHARGEABILITY:
1802	INSTALL BOLT,MACHINE	ORG	ORG	ORG	CLOCK	0	2	0.0	MILES	TIR#: K2-E00037-
					MAN	0	2	0.0	MOTHRS	INCIDENT DATE: 88/06/23
					DIAG-CLK	0	1	0.0	PTOHRS	FD/SC STEP: 01-
					DIAG-MAN	0	1	0.0	ENGHRS	FD/SC CLASS: NO TEST
										SUBSYSTEM: CHASSIS
										MAINT. TYPE/TIME: UNSCH / NON-CHARGEABLE
										INCIDENT CLASS: MINOR
										CHARGEABILITY:
7202	NONE METER,VOLUMETRIC	CREW	CREW	CREW	CLOCK	0	1	390.0	MILES	TIR#: K2-E00039-
					MAN	0	1	15.2	MOTHRS	INCIDENT DATE: 88/06/27
					DIAG-CLK	0	1	2.1	PTOHRS	FD/SC STEP: 01-
					DIAG-MAN	0	1	17.2	ENGHRS	FD/SC CLASS: NO TEST
										SUBSYSTEM: ANCILLARY
										MAINT. TYPE/TIME: UNSCH / NON-CHARGEABLE
										INCIDENT CLASS: INFORMATION
										CHARGEABILITY:
1811	DIAGNOSE VALVE,RELIEF,PRESSURE	CREW	CREW	CREW	CLOCK	0	0	390.0	MILES	TIR#: K2-E00040-
					MAN	0	0	15.2	MOTHRS	INCIDENT DATE: 88/06/27
					DIAG-CLK	0	0	2.1	PTOHRS	FD/SC STEP: 12-
					DIAG-MAN	0	0	17.2	ENGHRS	FD/SC CLASS: SF,OMF/UNSCHED MAINT
										SUBSYSTEM: ANCILLARY
										MAINT. TYPE/TIME: UNSCH / NON-CHARGEABLE
										INCIDENT CLASS: MAJOR
										CHARGEABILITY:

COMPACT SUPPORTABILITY ANALYSIS CHART DATE 12/02/88

COMBAT SYSTEMS TEST ACTIVITY APG MD. | PROJECT NUMBER 1-VG-120-HMT-028 | PROJECT NAME CPT OF HEMTT, M978 TANKER | ITEM-ID NPOF6Y

FUNCTIONAL GROUP	ACTION AND INCIDENT SUBJECT	MAINTENANCE USED	LEVEL PRESC	RECOM		MAINTENANCE HOURS	MIN	ITEM LIFE		
0000	SERVICE	CREW	CREW	CREW	CLOCK	0	30	753.0	MILES	TIR#: K2-E00041-
	M978 HEMTT NPOF6Y				MAN	0	30	28.1	MOTHRS	INCIDENT DATE: 88/06/30
					DIAG-CLK	0	0	6.3	PTOHRS	FD/SC STEP: 05-
					DIAG-MAN	0	0	35.2	ENGHRS	FD/SC CLASS: SCHED MAINT
										SUBSYSTEM: CHASSIS
										MAINT. TYPE/TIME: SCHED / NON-CHARGEABLE
										INCIDENT CLASS: INFORMATION
										CHARGEABILITY:
1004	NONE	ORG	ORG	ORG	CLOCK	0	2	753.0	MILES	TIR#: K2-E00042-
	SEAL				MAN	0	2	28.1	MOTHRS	INCIDENT DATE: 88/06/30
					DIAG-CLK	0	2	6.3	PTOHRS	FD/SC STEP: 12-
					DIAG-MAN	0	2	35.2	ENGHRS	FD/SC CLASS: SF,OMF/UNSCHED MAINT
										SUBSYSTEM: CHASSIS
										MAINT. TYPE/TIME: UNSCH / NON-CHARGEABLE
										INCIDENT CLASS: MAJOR
										CHARGEABILITY:
1004	REPLACE	DS	DS	DS	CLOCK	1	15	753.0	MILES	TIR#: K2-E00042A
	SEAL				MAN	1	15	28.1	MOTHRS	INCIDENT DATE: 88/06/30
					DIAG-CLK	0	0	6.3	PTOHRS	FD/SC STEP: 09A
					DIAG-MAN	0	0	35.2	ENGHRS	FD/SC CLASS: UNSCHED MAINT
										SUBSYSTEM: CHASSIS
										MAINT. TYPE/TIME: UNSCH / CHARGEABLE
										INCIDENT CLASS: INFORMATION
										CHARGEABILITY:
1004	NONE	ORG	ORG	ORG	CLOCK	0	3	1376.0	MILES	TIR#: K2-E00043-
	SEAL				MAN	0	3	52.9	MOTHRS	INCIDENT DATE: 88/07/07
					DIAG-CLK	0	3	12.3	PTOHRS	FD/SC STEP: 12-
					DIAG-MAN	0	3	69.4	ENGHRS	FD/SC CLASS: SF,OMF/UNSCHED MAINT
										SUBSYSTEM: CHASSIS
										MAINT. TYPE/TIME: UNSCH / NON-CHARGEABLE
										INCIDENT CLASS: MAJOR
										CHARGEABILITY:
1004	REPLACE	DS	DS	DS	CLOCK	0	46	1376.0	MILES	TIR#: K2-E00043A
	SEAL				MAN	0	46	52.9	MOTHRS	INCIDENT DATE: 88/07/08
					DIAG-CLK	0	0	12.3	PTOHRS	FD/SC STEP: 09A
					DIAG-MAN	0	0	69.4	ENGHRS	FD/SC CLASS: UNSCHED MAINT
										SUBSYSTEM: CHASSIS
										MAINT. TYPE/TIME: UNSCH / CHARGEABLE
										INCIDENT CLASS: INFORMATION
										CHARGEABILITY:

COMPACT SUPPORTABILITY ANALYSIS CHART DATE 12/02/88

COMBAT SYSTEMS TEST ACTIVITY APG MD. | PROJECT NUMBER 1-VG-120-HMT-028 | PROJECT NAME CPT OF HEMTT, M978 TANKER | ITEM-ID NPOF6Y

FUNCTIONAL GROUP	ACTION AND INCIDENT SUBJECT	MAINTENANCE LEVEL USED	PRESC	RECOM	MAINTENANCE HOURS	MIN	ITEM LIFE			
0000	SERVICE M978 MODULE ASSY,TANKER	ORG	ORG	ORG	CLOCK	0	3	1385.0	MILES	TIR#: K2-E00044-
					MAN	0	3	54.3	MOTHRS	INCIDENT DATE: 88/07/08
					DIAG-CLK	0	0	13.4	PTOHRS	FD/SC STEP: 05-
					DIAG-MAN	0	0	71.1	ENGHRS	FD/SC CLASS: SCHED MAINT
										SUBSYSTEM: ANCILLARY
										MAINT. TYPE/TIME: SCHED / CHARGEABLE
										INCIDENT CLASS: INFORMATION
										CHARGEABILITY:
0000	SERVICE M978 HEMTT NPOF6Y	ORG	ORG	ORG	CLOCK	1	0	1385.0	MILES	TIR#: K2-E00045-
					MAN	1	0	54.3	MOTHRS	INCIDENT DATE: 88/07/08
					DIAG-CLK	0	0	13.4	PTOHRS	FD/SC STEP: 05-
					DIAG-MAN	0	0	71.1	ENGHRS	FD/SC CLASS: SCHED MAINT
										SUBSYSTEM: CHASSIS
										MAINT. TYPE/TIME: SCHED / CHARGEABLE
										INCIDENT CLASS: INFORMATION
										CHARGEABILITY:
1102	SERVICE CARRIER ASSEMBLY	ORG	ORG	ORG	CLOCK	0	46	1653.0	MILES	TIR#: K2-E00046-
					MAN	0	48	64.6	MOTHRS	INCIDENT DATE: 88/07/12
					DIAG-CLK	0	13	16.6	PTOHRS	FD/SC STEP: 06-
					DIAG-MAN	0	13	85.8	ENGHRS	FD/SC CLASS: UNSCHED MAINT
										SUBSYSTEM: CHASSIS
										MAINT. TYPE/TIME: UNSCH / NON-CHARGEABLE
										INCIDENT CLASS: INFORMATION
										CHARGEABILITY:
1808	NONE ELBOW,FLANGE TO PIP	ORG	ORG	ORG	CLOCK	0	10	1643.0	MILES	TIR#: K2-E00047-
					MAN	0	40	64.1	MOTHRS	INCIDENT DATE: 88/07/12
					DIAG-CLK	0	10	14.1	PTOHRS	FD/SC STEP: 01-
					DIAG-MAN	0	40	82.6	ENGHRS	FD/SC CLASS: NO TEST
										SUBSYSTEM: ANCILLARY
										MAINT. TYPE/TIME: UNSCH / NON-CHARGEABLE
										INCIDENT CLASS: INFORMATION
										CHARGEABILITY:
0000	SERVICE M978 HEMTT NPOF6Y	CREW	CREW	CREW	CLOCK	0	15	1786.0	MILES	TIR#: K2-E00048-
					MAN	0	15	70.6	MOTHRS	INCIDENT DATE: 88/07/13
					DIAG-CLK	0	0	16.6	PTOHRS	FD/SC STEP: 05-
					DIAG-MAN	0	0	92.1	ENGHRS	FD/SC CLASS: SCHED MAINT
										SUBSYSTEM: CHASSIS
										MAINT. TYPE/TIME: UNSCH / NON-CHARGEABLE
										INCIDENT CLASS: INFORMATION
										CHARGEABILITY:

COMPACT SUPPORTABILITY ANALYSIS CHART DATE 12/02/88

COMBAT SYSTEMS TEST ACTIVITY
APG MD.

PROJECT NUMBER
1-VG-120-HMT-028

PROJECT NAME
CPT OF HEMTT, M978 TANKER

ITEM-ID
NPOF6Y

FUNCTIONAL GROUP	ACTION AND INCIDENT SUBJECT	MAINTENANCE LEVEL USED	PRESC	RECOM	MAINTENANCE HOURS	MIN	ITEM LIFE			
1811	SERVICE MODULE ASSY,TANKER	ORG	ORG	ORG	CLOCK 0 MAN 0 DIAG-CLK 0 DIAG-MAN 0	39 39 0 0	2804.0 MILES 112.3 MOTHRS 28.1 PTOHRS 148.4 ENGHRS	TIR#: INCIDENT DATE: FD/SC STEP: FD/SC CLASS: SUBSYSTEM: MAINT. TYPE/TIME: INCIDENT CLASS: CHARGEABILITY:	K2-E00049- 88/07/21 05- SCHED MAINT ANCILLARY SCHED / INFORMATION	CHARGEABLE
0000	SERVICE M978 HEMTT NPOF6Y	CREW	CREW	CREW	CLOCK 0 MAN 0 DIAG-CLK 0 DIAG-MAN 0	17 17 0 0	2804.0 MILES 112.3 MOTHRS 28.1 PTOHRS 148.4 ENGHRS	TIR#: INCIDENT DATE: FD/SC STEP: FD/SC CLASS: SUBSYSTEM: MAINT. TYPE/TIME: INCIDENT CLASS: CHARGEABILITY:	K2-E00050- 88/07/21 05- SCHED MAINT CHASSIS SCHED / INFORMATION	NON-CHARGEABLE
1811	SERVICE MODULE ASSY,TANKER	CREW	CREW	CREW	CLOCK 0 MAN 0 DIAG-CLK 0 DIAG-MAN 0	3 3 0 0	2804.0 MILES 112.3 MOTHRS 28.1 PTOHRS 148.4 ENGHRS	TIR#: INCIDENT DATE: FD/SC STEP: FD/SC CLASS: SUBSYSTEM: MAINT. TYPE/TIME: INCIDENT CLASS: CHARGEABILITY:	K2-E00051- 88/07/21 05- SCHED MAINT ANCILLARY SCHED / INFORMATION	NON-CHARGEABLE
0306	REPLACE STRAP	ORG	ORG	ORG	CLOCK 0 MAN 0 DIAG-CLK 0 DIAG-MAN 0	47 47 1 1	2804.0 MILES 112.3 MOTHRS 28.1 PTOHRS 148.4 ENGHRS	TIR#: INCIDENT DATE: FD/SC STEP: FD/SC CLASS: SUBSYSTEM: MAINT. TYPE/TIME: INCIDENT CLASS: CHARGEABILITY:	K2-E00052- 88/07/21 07- UNSCHED MAINT CHASSIS UNSCH / MINOR	CHARGEABLE
1202	ADJUST ADJUSTER,SLACK,BRAK	ORG	ORG	ORG	CLOCK 0 MAN 0 DIAG-CLK 0 DIAG-MAN 0	10 10 5 5	2804.0 MILES 112.3 MOTHRS 28.1 PTOHRS 148.4 ENGHRS	TIR#: INCIDENT DATE: FD/SC STEP: FD/SC CLASS: SUBSYSTEM: MAINT. TYPE/TIME: INCIDENT CLASS: CHARGEABILITY:	K2-E00053- 88/07/21 07- UNSCHED MAINT CHASSIS UNSCH / MINOR	CHARGEABLE

COMPACT SUPPORTABILITY ANALYSIS CHART DATE 12/02/88

COMBAT SYSTEMS TEST ACTIVITY APG MD. | PROJECT NUMBER 1-VG-120-HMT-028 | PROJECT NAME CPT OF HEMTT, M978 TANKER | ITEM-ID NPOF6Y

FUNCTIONAL GROUP	ACTION AND INCIDENT SUBJECT	MAINTENANCE LEVEL USED	PRESC	RECOM	MAINTENANCE HOURS	MIN	ITEM LIFE			
0609	REPLACE LAMP, INCANDESCENT	ORG	ORG	ORG	CLOCK	0	10	2804.0	MILES	TIR#: K2-E00054-
					MAN	0	10	112.3	MOTHRS	INCIDENT DATE: 88/07/21
					DIAG-CLK	0	5	28.1	PTOHRS	FD/SC STEP: 07-
					DIAG-MAN	0	5	148.4	ENGHRS	FD/SC CLASS: UNSCHED MAINT
										SUBSYSTEM: CHASSIS
										MAINT. TYPE/TIME: UNSCH / CHARGEABLE
										INCIDENT CLASS: MINOR
										CHARGEABILITY:
1503	REPAIR BOLT, FLUID PASSAGE	ORG	ORG	ORG	CLOCK	0	15	2804.0	MILES	TIR#: K2-E00055-
					MAN	0	15	112.3	MOTHRS	INCIDENT DATE: 88/07/21
					DIAG-CLK	0	4	28.3	PTOHRS	FD/SC STEP: 07-
					DIAG-MAN	0	4	148.4	ENGHRS	FD/SC CLASS: UNSCHED MAINT
										SUBSYSTEM: CHASSIS
										MAINT. TYPE/TIME: UNSCH / CHARGEABLE
										INCIDENT CLASS: MINOR
										CHARGEABILITY:
0000	SERVICE M978 HEMTT NPOF6Y	ORG	ORG	ORG	CLOCK	3	8	2804.0	MILES	TIR#: K2-E00056-
					MAN	3	8	112.3	MOTHRS	INCIDENT DATE: 88/07/21
					DIAG-CLK	0	0	28.3	PTOHRS	FD/SC STEP: 05-
					DIAG-MAN	0	0	148.4	ENGHRS	FD/SC CLASS: SCHED MAINT
										SUBSYSTEM: CHASSIS
										MAINT. TYPE/TIME: SCHED / CHARGEABLE
										INCIDENT CLASS: INFORMATION
										CHARGEABILITY:
0000	SERVICE M978 HEMTT NPOF6Y	CREW	CREW	CREW	CLOCK	0	8	3777.0	MILES	TIR#: K2-E00057-
					MAN	0	8	151.4	MOTHRS	INCIDENT DATE: 88/07/29
					DIAG-CLK	0	0	37.0	PTOHRS	FD/SC STEP: 05-
					DIAG-MAN	0	0	199.0	ENGHRS	FD/SC CLASS: SCHED MAINT
										SUBSYSTEM: CHASSIS
										MAINT. TYPE/TIME: SCHED / NON-CHARGEABLE
										INCIDENT CLASS: INFORMATION
										CHARGEABILITY:
1811	SERVICE MODULE ASSY, TANKER	CREW	CREW	CREW	CLOCK	0	3	3777.0	MILES	TIR#: K2-E00058-
					MAN	0	3	151.4	MOTHRS	INCIDENT DATE: 88/07/29
					DIAG-CLK	0	0	37.0	PTOHRS	FD/SC STEP: 05-
					DIAG-MAN	0	0	199.0	ENGHRS	FD/SC CLASS: SCHED MAINT
										SUBSYSTEM: ANCILLARY
										MAINT. TYPE/TIME: SCHED / NON-CHARGEABLE
										INCIDENT CLASS: INFORMATION
										CHARGEABILITY:

COMPACT SUPPORTABILITY ANALYSIS CHART DATE 12/02/88

COMBAT SYSTEMS TEST ACTIVITY APG MD. | PROJECT NUMBER 1-VG-120-HMT-028 | PROJECT NAME CPT OF HEMTT, M978 TANKER | ITEM-ID NPOF6Y

FUNCTIONAL GROUP	ACTION AND INCIDENT SUBJECT	MAINTENANCE LEVEL USED	PRESC	RECOM	MAINTENANCE HOURS	MIN	ITEM LIFE	
7202	DIAGNOSE PUMP,CENTRIFUGAL	ORG	ORG	ORG	CLOCK 0 MAN 0 DIAG-CLK 0 DIAG-MAN 0	45 45 1 1	3777.0 MILES 151.4 MOTHRS 39.0 PTOHRS 201.4 ENGHRS	TIR#: K2-E00059- INCIDENT DATE: 88/07/29 FD/SC STEP: 12- FD/SC CLASS: SF,OMF/UNSCHED MAINT SUBSYSTEM: ANCILLARY MAINT. TYPE/TIME: UNSCH / CHARGEABLE INCIDENT CLASS: MAJOR CHARGEABILITY:
7202	REPLACE PUMP ASSY, SELF PRM	ORG	ORG	ORG	CLOCK 5 MAN 5 DIAG-CLK 0 DIAG-MAN 0	5 5 0 0	3777.0 MILES 151.4 MOTHRS 39.0 PTOHRS 201.4 ENGHRS	TIR#: K2-E00059A INCIDENT DATE: 88/07/29 FD/SC STEP: 09A FD/SC CLASS: UNSCHED MAINT SUBSYSTEM: ANCILLARY MAINT. TYPE/TIME: UNSCH / CHARGEABLE INCIDENT CLASS: INFORMATION CHARGEABILITY:
7202	NONE PUMP ASSY, SELF PRM	ORG	ORG	ORG	CLOCK 0 MAN 0 DIAG-CLK 0 DIAG-MAN 0	1 1 1 1	3786.0 MILES 152.1 MOTHRS 39.9 PTOHRS 203.1 ENGHRS	TIR#: K2-E00060- INCIDENT DATE: 88/08/04 FD/SC STEP: 06- FD/SC CLASS: SF,OMF/UNSCHED MAINT SUBSYSTEM: ANCILLARY MAINT. TYPE/TIME: UNSCH / NON-CHARGEABLE INCIDENT CLASS: MAJOR CHARGEABILITY:
7202	REPAIR PUMP,CENTRIFUGAL	GS	GS	GS	CLOCK 1 MAN 2 DIAG-CLK 1 DIAG-MAN 1	59 3 34 38	3786.0 MILES 152.1 MOTHRS 39.9 PTOHRS 203.1 ENGHRS	TIR#: K2-E00060A INCIDENT DATE: 88/08/04 FD/SC STEP: 01- FD/SC CLASS: NO TEST SUBSYSTEM: ANCILLARY MAINT. TYPE/TIME: UNSCH / NON-CHARGEABLE INCIDENT CLASS: INFORMATION CHARGEABILITY:
0308	MODIFY SOLENOID, ELECTRICAL	ORG	ORG	ORG	CLOCK 0 MAN 1 DIAG-CLK 0 DIAG-MAN 0	55 1 0 0	3788.0 MILES 152.3 MOTHRS 40.2 PTOHRS 203.2 ENGHRS	TIR#: K2-E00061- INCIDENT DATE: 88/08/10 FD/SC STEP: 04- FD/SC CLASS: NO TEST SUBSYSTEM: CHASSIS MAINT. TYPE/TIME: UNSCH / NON-CHARGEABLE INCIDENT CLASS: INFORMATION CHARGEABILITY:

COMPACT SUPPORTABILITY ANALYSIS CHART DATE 12/02/88

COMBAT SYSTEMS TEST ACTIVITY APG MD. | PROJECT NUMBER 1-VG-120-HMT-028 | PROJECT NAME CPT OF HEMTT, M978 TANKER | ITEM-ID NPOF6Y

FUNCTIONAL GROUP	ACTION AND INCIDENT SUBJECT	MAINTENANCE LEVEL USED	PRESC	RECOM'	MAINTENANCE HOURS	MIN	ITEM LIFE		
7202	DIAGNOSE PUMP,CENTRIFUGAL	ORG	ORG	ORG	CLOCK	0	0	3789.0	MILES
					MAN	0	0	152.5	MOTHRS
					DIAG-CLK	0	0	41.0	PTOHRS
					DIAG-MAN	0	0	205.1	ENGHRS
7202	REPLACE PUMP,CENTRIFUGAL	ORG	ORG	ORG	CLOCK	2	46	3789.0	MILES
					MAN	2	52	152.5	MOTHRS
					DIAG-CLK	0	0	41.0	PTOHRS
					DIAG-MAN	0	0	205.1	ENGHRS
7203	REPAIR COUPLING,CLAMP,PIPE	ORG	ORG	ORG	CLOCK	0	5	3889.2	MILES
					MAN	0	5	158.0	MOTHRS
					DIAG-CLK	0	5	41.2	PTOHRS
					DIAG-MAN	0	5	211.3	ENGHRS
0501	REPAIR RADIATOR,ENGINE COO	ORG	ORG	ORG	CLOCK	0	35	3899.0	MILES
					MAN	0	47	158.6	MOTHRS
					DIAG-CLK	0	15	41.2	PTOHRS
					DIAG-MAN	0	18	212.0	ENGHRS
1811	DIAGNOSE MODULE WELDMENT	ORG	ORG	ORG	CLOCK	0	0	3902.0	MILES
					MAN	0	0	158.7	MOTHRS
					DIAG-CLK	0	0	41.4	PTOHRS
					DIAG-MAN	0	0	212.4	ENGHRS

TIR#:	K2-E00062-	TIR#:	K2-E00062A
INCIDENT DATE:	88/08/11	INCIDENT DATE:	88/08/11
FD/SC STEP:	01-	FD/SC STEP:	09A
FD/SC CLASS:	NO TEST	FD/SC CLASS:	UNSCHED MAINT
SUBSYSTEM:	ANCILLARY	SUBSYSTEM:	ANCILLARY
MAINT. TYPE/TIME:	UNSCH / NON-CHARGEABLE	MAINT. TYPE/TIME:	UNSCH / CHARGEABLE
INCIDENT CLASS:	MAJOR	INCIDENT CLASS:	INFORMATION
CHARGEABILITY:		CHARGEABILITY:	

TIR#:	K2-E00063-	TIR#:	K2-E00064-
INCIDENT DATE:	88/08/16	INCIDENT DATE:	88/08/17
FD/SC STEP:	12-	FD/SC STEP:	11-
FD/SC CLASS:	SF,OMF/UNSCHED MAINT	FD/SC CLASS:	SF/UNSCHED MAINT
SUBSYSTEM:	ANCILLARY	SUBSYSTEM:	CHASSIS
MAINT. TYPE/TIME:	UNSCH / CHARGEABLE	MAINT. TYPE/TIME:	UNSCH / CHARGEABLE
INCIDENT CLASS:	MAJOR	INCIDENT CLASS:	MINOR
CHARGEABILITY:		CHARGEABILITY:	

TIR#:	K2-E00065-		
INCIDENT DATE:	88/08/17		
FD/SC STEP:	08-		
FD/SC CLASS:	UNSCHED MAINT		
SUBSYSTEM:	ANCILLARY		
MAINT. TYPE/TIME:	UNSCH / NON-CHARGEABLE		
INCIDENT CLASS:	MINOR		
CHARGEABILITY:			

COMPACT SUPPORTABILITY ANALYSIS CHART DATE 12/02/88

COMBAT SYSTEMS TEST ACTIVITY APG MD. | PROJECT NUMBER 1-VG-120-HMT-028 | PROJECT NAME CPT OF HEMTT, M978 TANKER | ITEM-ID NPOF6Y

FUNCTIONAL GROUP	ACTION AND INCIDENT SUBJECT	MAINTENANCE USED	LEVEL PRESC	RECOM	MAINTENANCE HOURS	MIN	ITEM LIFE			
1504	NONE TIRE CARRIER, SPARE	ORG	ORG	ORG	CLOCK MAN DIAG-CLK DIAG-MAN	0 0 0 0	0 0 0 0	3902.0 MILES 158.7 MOTHRS 41.4 PTOHRS 212.4 ENGHRS	TIR#: INCIDENT DATE: FD/SC STEP: FD/SC CLASS: SUBSYSTEM: MAINT. TYPE/TIME: INCIDENT CLASS: CHARGEABILITY:	K2-E00066- 88/08/17 08- UNSCHED MAINT CHASSIS UNSCH / NON-CHARGEABLE MINOR
0401	NONE GUARD, MUFFLER-EXHAU	ORG	ORG	ORG	CLOCK MAN DIAG-CLK DIAG-MAN	0 0 0 0	0 0 0 0	3902.0 MILES 158.7 MOTHRS 41.4 PTOHRS 212.4 ENGHRS	TIR#: INCIDENT DATE: FD/SC STEP: FD/SC CLASS: SUBSYSTEM: MAINT. TYPE/TIME: INCIDENT CLASS: CHARGEABILITY:	K2-E00067- 88/08/17 08- UNSCHED MAINT CHASSIS UNSCH / NON-CHARGEABLE MINOR
0401	NONE GUARD, MUFFLER - EXHAU	ORG	ORG	ORG	CLOCK MAN DIAG-CLK DIAG-MAN	0 0 0 0	0 0 0 0	3902.0 MILES 158.7 MOTHRS 41.4 PTOHRS 212.4 ENGHRS	TIR#: INCIDENT DATE: FD/SC STEP: FD/SC CLASS: SUBSYSTEM: MAINT. TYPE/TIME: INCIDENT CLASS: CHARGEABILITY:	K2-E00068- 88/08/17 08- UNSCHED MAINT CHASSIS UNSCH / NON-CHARGEABLE MINOR
1811	NONE TANK, WELDMENT	ORG	ORG	ORG	CLOCK MAN DIAG-CLK DIAG-MAN	0 0 0 0	0 0 0 0	3902.0 MILES 158.7 MOTHRS 41.4 PTOHRS 212.4 ENGHRS	TIR#: INCIDENT DATE: FD/SC STEP: FD/SC CLASS: SUBSYSTEM: MAINT. TYPE/TIME: INCIDENT CLASS: CHARGEABILITY:	K2-E00069- 88/08/17 08- UNSCHED MAINT ANCILLARY UNSCH / NON-CHARGEABLE MINOR
0000	SERVICE M978 HEMTT NPOF6Y	ORG	ORG	ORG	CLOCK MAN DIAG-CLK DIAG-MAN	0 0 0 0	24 24 0 0	4235.0 MILES 174.5 MOTHRS 45.2 PTOHRS 233.3 ENGHRS	TIR#: INCIDENT DATE: FD/SC STEP: FD/SC CLASS: SUBSYSTEM: MAINT. TYPE/TIME: INCIDENT CLASS: CHARGEABILITY:	K2-E00070- 88/08/19 05- SCHED MAINT CHASSIS SCHED / CHARGEABLE INFORMATION

COMPACT SUPPORTABILITY ANALYSIS CHART DATE 12/02/88

COMBAT SYSTEMS TEST ACTIVITY APG MD. | PROJECT NUMBER 1-VG-120-HMT-028 | PROJECT NAME CPT OF HEMTT, M978 TANKER | ITEM-ID NPOF6Y

FUNCTIONAL GROUP	ACTION AND INCIDENT SUBJECT	MAINTENANCE USED	MAINTENANCE PRESC	LEVEL RECOM	MAINTENANCE HOURS	MIN	ITEM LIFE			
1811	SERVICE MODULE ASSY,TANKER	ORG	ORG	ORG	CLOCK MAN DIAG-CLK DIAG-MAN	0 0 0 0	1 1 0 0	4235.0 MILES 174.5 MOTHRS 45.2 PTOHRS 233.3 ENGHRS	TIR#: INCIDENT DATE: FD/SC STEP: FD/SC CLASS: SUBSYSTEM: MAINT. TYPE/TIME: INCIDENT CLASS: CHARGEABILITY:	K2-E00071- 88/08/19 05- SCHED MAINT ANCILLARY SCHED / CHARGEABLE INFORMATION
1202	ADJUST ADJUSTER,SLACK,BRAK	ORG	ORG	ORG	CLOCK MAN DIAG-CLK DIAG-MAN	0 0 0 0	12 12 0 0	4235.0 MILES 174.5 MOTHRS 45.2 PTOHRS 233.3 ENGHRS	TIR#: INCIDENT DATE: FD/SC STEP: FD/SC CLASS: SUBSYSTEM: MAINT. TYPE/TIME: INCIDENT CLASS: CHARGEABILITY:	K2-E00072- 88/08/19 07- UNSCHED MAINT CHASSIS UNSCH / CHARGEABLE MINOR
0609	ADJUST HEADLIGHT	ORG	ORG	ORG	CLOCK MAN DIAG-CLK DIAG-MAN	0 0 0 0	17 17 0 0	4798.0 MILES 193.5 MOTHRS 50.8 PTOHRS 258.8 ENGHRS	TIR#: INCIDENT DATE: FD/SC STEP: FD/SC CLASS: SUBSYSTEM: MAINT. TYPE/TIME: INCIDENT CLASS: CHARGEABILITY:	K2-E00073- 88/08/24 08- UNSCHED MAINT CHASSIS UNSCH / CHARGEABLE MINOR
1811	SERVICE MODULE ASSY,TANKER	CREW	CREW	CREW	CLOCK MAN DIAG-CLK DIAG-MAN	0 0 0 0	5 5 0 0	4945.0 MILES 197.5 MOTHRS 50.8 PTOHRS 263.5 ENGHRS	TIR#: INCIDENT DATE: FD/SC STEP: FD/SC CLASS: SUBSYSTEM: MAINT. TYPE/TIME: INCIDENT CLASS: CHARGEABILITY:	K2-E00074- 88/08/25 05- SCHED MAINT ANCILLARY SCHED / NON-CHARGEABLE INFORMATION
0000	SERVICE M978 HEMTT NPOF6Y	CREW	CREW	CREW	CLOCK MAN DIAG-CLK DIAG-MAN	0 0 0 0	6 6 0 0	4945.0 MILES 197.5 MOTHRS 50.8 PTOHRS 263.5 ENGHRS	TIR#: INCIDENT DATE: FD/SC STEP: FD/SC CLASS: SUBSYSTEM: MAINT. TYPE/TIME: INCIDENT CLASS: CHARGEABILITY:	K2-E00075- 88/08/25 05- SCHED MAINT CHASSIS SCHED / NON-CHARGEABLE INFORMATION

COMPACT SUPPORTABILITY ANALYSIS CHART DATE 12/02/88

COMBAT SYSTEMS TEST ACTIVITY APG MD. | PROJECT NUMBER 1-VG-120-HMT-028 | PROJECT NAME CPT OF HEMTT, M978 TANKER | ITEM-ID NPOF6Y

FUNCTIONAL GROUP	ACTION AND INCIDENT SUBJECT	MAINTENANCE USED	LEVEL PRESC	LEVEL RECOM	MAINTENANCE HOURS	MIN	ITEM LIFE			
0000	DIAGNOSE M978 HEMTT NPOF6Y	ORG	ORG	ORG	CLOCK 4	55	5052.0	MILES	TIR#:	K2-E00076-
					MAN 5	29	202.9	MOTHRS	INCIDENT DATE:	88/11/01
					DIAG-CLK 0	0	51.5	PTOHRS	FD/SC STEP:	01-
					DIAG-MAN 0	0	274.9	ENGHRS	FD/SC CLASS:	NO TEST
									SUBSYSTEM:	CHASSIS
									MAINT. TYPE/TIME:	UNSCH / NON-CHARGEABLE
									INCIDENT CLASS:	INFORMATION
									CHARGEABILITY:	
00-0	NONE M978 HEMTT NPOF6Y	ORG	ORG	ORG	CLOCK 0	1	5057.0	MILES	TIR#:	K2-E00077-
					MAN 0	1	203.2	MOTHRS	INCIDENT DATE:	88/11/02
					DIAG-CLK 0	0	51.5	PTOHRS	FD/SC STEP:	01-
					DIAG-MAN 0	0	275.2	ENGHRS	FD/SC CLASS:	NO TEST
									SUBSYSTEM:	CHASSIS
									MAINT. TYPE/TIME:	UNSCH / NON-CHARGEABLE
									INCIDENT CLASS:	INFORMATION
									CHARGEABILITY:	
00 0	SERVICE M978 HEMTT NPOF6Y	ORG	ORG	ORG	CLOCK 8	7	5057.0	MILES	TIR#:	K2-E00077A
					MAN 10	29	203.2	MOTHRS	INCIDENT DATE:	88/11/02
					DIAG-CLK 0	0	51.5	PTOHRS	FD/SC STEP:	01-
					DIAG-MAN 0	0	275.2	ENGHRS	FD/SC CLASS:	NO TEST
									SUBSYSTEM:	CHASSIS
									MAINT. TYPE/TIME:	UNSCH / NON-CHARGEABLE
									INCIDENT CLASS:	INFORMATION
									CHARGEABILITY:	
0000	SERVICE M978 HEMTT NPOF6Y	ORG	ORG	ORG	CLOCK 4	31	5062.0	MILES	TIR#:	K2-E00077B
					MAN 14	56	203.9	MOTHRS	INCIDENT DATE:	88/11/18
					DIAG-CLK 0	0	51.5	PTOHRS	FD/SC STEP:	01-
					DIAG-MAN 0	0	276.7	ENGHRS	FD/SC CLASS:	NO TEST
									SUBSYSTEM:	CHASSIS
									MAINT. TYPE/TIME:	UNSCH / NON-CHARGEABLE
									INCIDENT CLASS:	INFORMATION
									CHARGEABILITY:	
1501	REPLACE SCREW,CAP,HEXAGON H	ORG	ORG	ORG	CLOCK 0	7	5062.0	MILES	TIR#:	K2-E00078-
					MAN 0	7	203.9	MOTHRS	INCIDENT DATE:	88/11/18
					DIAG-CLK 0	1	51.5	PTOHRS	FD/SC STEP:	01-
					DIAG-MAN 0	1	276.7	ENGHRS	FD/SC CLASS:	NO TEST
									SUBSYSTEM:	CHASSIS
									MAINT. TYPE/TIME:	UNSCH / CHARGEABLE
									INCIDENT CLASS:	INFORMATION
									CHARGEABILITY:	

COMPACT SUPPORTABILITY ANALYSIS CHART DATE 12/02/88

COMBAT SYSTEMS TEST ACTIVITY APG MD. | PROJECT NUMBER 1-VG-120-HMT-028 | PROJECT NAME CPT OF HEMTT, M978 TANKER | ITEM-ID NPOF6Y

FUNCTIONAL GROUP	ACTION AND INCIDENT SUBJECT	MAINTENANCE USED	MAINTENANCE PRESC	LEVEL RECOM	MAINTENANCE HOURS	MIN	ITEM LIFE			
0000	NONE M978 HEMTT NPOF6Y	ORG	ORG	ORG	CLOCK MAN DIAG-CLK DIAG-MAN	0 0 0 0	0 0 0 0	5062.0 MILES 203.9 MOTHRS 51.5 PTOHRS 276.7 ENGHRS	TIR#: INCIDENT DATE: FD/SC STEP: FD/SC CLASS: SUBSYSTEM: MAINT. TYPE/TIME: INCIDENT CLASS: CHARGEABILITY:	K2-E00079- 88/11/22 01- NO TEST CHASSIS SCHED / NON-CHARGEABLE INFORMATION
0000	SERVICE M978 HEMTT NPOF6Y	ORG	ORG	ORG	CLOCK MAN DIAG-CLK DIAG-MAN	5 5 0 0	7 34 0 0	5062.0 MILES 203.9 MOTHRS 51.5 PTOHRS 276.7 ENGHRS	TIR#: INCIDENT DATE: FD/SC STEP: FD/SC CLASS: SUBSYSTEM: MAINT. TYPE/TIME: INCIDENT CLASS: CHARGEABILITY:	K2-E00080- 88/11/21 02- NO TEST CHASSIS SCHED / NON-CHARGEABLE INFORMATION
1811	SERVICE MODULE ASSY,TANKER	ORG	ORG	ORG	CLOCK MAN DIAG-CLK DIAG-MAN	0 0 0 0	18 18 0 0	5062.0 MILES 203.9 MOTHRS 51.5 PTOHRS 276.7 ENGHRS	TIR#: INCIDENT OATE: FD/SC STEP: FD/SC CLASS: SUBSYSTEM: MAINT. TYPE/TIME: INCIDENT CLASS: CHARGEABILITY:	K2-E00081- 88/11/21 02- NO TEST ANCILLARY SCHED / NON-CHARGEABLE INFORMATION

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